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## A PLEA FOR THE ESTABLISHMENT OF SCIENTIFIC SUPPLIES STORES IN INDIA

THE difficult and unhappy position in which scientific workers in India have continued to find themselves with regard to the supply of essential research equipment, glassware and chemicals is an irritating circumstance which we have helplessly and patiently tolerated all these years. The blame for not having built up a scientific instrument industry in the country should be laid at the door of the scientific worker who has not taken the initiative to organise precision instrument shops and fine chemical factories, where he could have forged his research "tools" and his essential chemicals. He has lost two golden opportunities, the periods of the two world wars, during which many of his compeers in other countries similarly situated, stole a march over him and established industries which not only met his needs but left a surplus for export.

A few feeble and inconsequential attempts have, however, been made; they did not secure the support they deserved. The wartime prosperity which was only transient vanished with the return of peace.

There are in general two channels through which these supplies are obtained by Government departments, the research institutes and the Universities. They are: (1) reputed commercial concerns or (2) some agency of Government such as the Indian Stores Department,—Director-General of Industries and Supply, Trade Commissioners, Scientific Liaison Officers and Supply Missions attached to the Embassies, etc. With both these channels, the administrative machinery is complex, involved and sluggish, resulting in considerable delays.

In addition, the cost of the material is considerably enhanced by the time it reaches the laboratory *via* a number of commercial intermediaries. In a survey conducted at one of the larger research institutions in South India, it was found that the cost of chemicals and glassware imported directly from U.K. or U.S.A. after landing at that laboratory, was approximately 2½ to 5 times less than that of those articles purchased from Indian commercial concerns. It is estimated that in a centre like Bangalore alone, roughly 6-7 lakhs are

being annually spent in excess of the legitimate costs of those articles due to lack of central organisations for these supplies. The following plan is therefore suggested for the consideration of the authorities concerned, with the primary aim of achieving two objectives: (1) Economy of funds and (2) Speed of procurement.

It is suggested that in the first instance, four Regional Scientific Supplies Stores be organised, one each at Calcutta, Delhi, Bombay and Bangalore, to be either directly in charge of the Department of Scientific Research of the Government of India, or to be managed by an approved firm of suppliers under the control of the Central Government. Almost all research institutions, University laboratories, etc., within the orbit of each of these centres can be served easily and effectively from these four cities. Each of these centres would collect the requirements of the next two years of various research institutions in their zones, secure currency releases for articles to be imported, call for quotations either from local dealers or from manufacturers directly, arrange for inspection, finalise the transactions for purchases, and stock the materials in their Stores. The laboratory or department concerned would then merely arrange to draw from this store its requirements as and when needed.

This procedure would save much unnecessary correspondence, expense and delay in the procurement of these materials and would effect a substantial saving in the costs of materials as also in packing, freight, insurance costs, etc. In some cases, where orders are placed directly with the manufacturers, it may even be possible to secure substantial discounts for bulk purchases. Moreover, the laboratories of research institutions would be saved a lot of administrative work and could then devote greater attention to the prosecution of research with increased speed and added enthusiasm. It is the experience of progressive research laboratories in our country and abroad that maximum efficiency can only be achieved if, in addition to other facilities, the Scientific Supplies Stores are located in the very backyard of the laboratory. An example in point is the organisation of Scientific Stores by the Defence Department for its research laboratories. Therefore, we urge the learned bodies of our country such as the Scientific Workers' Association, the Indian Science Congress, the National Institute of Sciences, etc., to give their expert opinions on the solution of this important problem, and jointly appeal to the Department of Scientific Research and to our leaders of Science to set up the necessary organisation to establish these scientific supplies stores in India at an early date.

K. K. I.
M. S.

## LADY TATA MEMORIAL TRUST

### Scholarships and Grants for the year 1950-51

THE Trustees of the Lady Tata Memorial Trust announce on the death anniversary of Lady Meherbai Dorabji Tata, 18th June 1950, the awards of Scholarships and Grants for the year 1950-51.

The International Awards of varying amounts (totalling £3,000) for research in diseases of the blood with special reference to Leucaemias are made to Doctors Edith Paterson (England), Pascou Atanasiu (France), J. Bichel (Denmark), E. Kelemen (Hungary), Charles Oberling (France), Gunther Schallock (Germany), Astrid Fagraeus and Bo Thorell (jointly) (Sweden), Niels M. G. Harboe (Denmark), M. Henri P. L. Febvre (France) and George Discombe (England).

Indian Scholarships of Rs. 250 per month each for one year for scientific investigations having a bearing on the alleviation of human suffering from disease are awarded to Messrs. P. R. Srinivasan (Coonoor), D. Siva Sankar (Madras), Gangagobinda Bhattacharya (Calcutta), and Doctors Dharmendra Pal Singh (Agra), Samavedam Srinivasa Sriramacharyulu (Andhra) and Dr. (Miss) Sunita Popatlal Bharani (Bombay). A special award of Rs. 100 a month for one year from July 1950 to Mr. Jamshed R. Tata (Bangalore) has also been made.

## PROGRESS OF RESEARCH IN NATIONAL LABORATORIES

AT the National Physical Laboratory in New Delhi, a precision Beta-Ray Spectrograph is now being built for studying the energy distribution of beta-radiations from radioactive substances. Many of the component parts, such as the power supply unit and linear amplifiers for simple and coincident counting, have already been assembled. These highly sensitive instruments are expected to record readings as small as a hundredth part of a second. The results of this study may find important application in the field of medicine where many radioactive substances are used for diagnostic and curative purposes.

The construction of a quartz clock which has been taken up will ultimately be controlled by an atomic clock providing a standard for the measurement of time which would be unaffected by known factors. For studies in optics, a number of optically plane and concave surfaces of substantial area, the largest about two feet in diameter, have been prepared. The reflecting surfaces are provided by extremely thin films of aluminium and other metals deposited by evaporation in vacuum.

Other investigations in the field of fundamental physics relate to the determination of nuclear magnetic moments by resonance of micro-waves and dispersion and absorption of ultrasonics in liquids.

In the sphere of applied physics, two important lines of investigation bearing on the preparation of carbon brushes and other carbon products, and separation of some rare earths from one another and study of their luminesence when used as activators in suitable phosphor are under way. These investigations are expected to find application in the preparation of luminous paints and gas mantles.

The National Chemical Laboratory at Poona is conducting experiments on the utilization of tobacco seed and safflower oils in the manufacture of paints and varnishes.

In the Inorganic Division, new and quick methods of estimating rare metals and minerals are being developed. Work has also begun on the beneficiation of ores of precious metals.

Processes for the manufacture of citric acid, calcium gluconate and vitamin C have been developed in the Biochemistry Division. The economic implications and technical aspects of these processes are now being investigated with a view to making the processes available to industry at an early date.

In the Fuel Research Institute at Dhanbad, investigations on the subject of coal washing are in progress, and a cyclone type of washer has been designed. Another line of investigation is the possibility of separating fractions of coals with reduced ash and improved coking characteristics from high ash coals by controlled breakage and subsequent screening. This is expected to result in separation of vitrain from durain in coal.

The Central Glass and Ceramics Research Institute in Calcutta has evolved a good thermal insulating material from waste glass styled "Foam Glass"; this is light and porous, and its use in house construction should tend to reduce the effects of extreme heat and bitter cold. It is expected that the investigation will shortly reach a stage when commercial production can be begun.

The National Metallurgical Laboratory at Jamshedpur is evolving a process by which low-grade manganese ores can be converted into manganese sulphate for the production of electrolytic manganese diaoxide. Work on the control of grain size in austenite steels is being continued. This should lead to better use being made of imported metals, such as nickel and chromium.

The Building Research Unit at Roorkee has been concentrating on low-cost houses and conducting a series of investigations on sun-dried clay roofing tiles, soil cement floors and wall plasters from mud. A survey of clays used in the making of bricks in various parts of the country with a view to determining the compressive strength of the bricks is in progress.

## CENTRAL GLASS AND CERAMIC RESEARCH INSTITUTE

THE fourth in the chain of National Laboratories the Central Glass and Ceramic Research Institute is being rapidly fitted up and will soon be formally opened in Calcutta.

The Institute which is now working with a nucleus staff under a Joint Director, is already serving as the Central Bureau of technical information for the ceramic and glass industry in the country. A large number of requests for advice have been attended to and when the Institute starts functioning with full complement, it is hoped that it will serve as the main focus of research and development in ceramic and glass industry in India.

# IT'S FOR YOU TO CHOOSE*

EDWARD M. WEYER, JR.

WE think of 50 years as a long time. On Earth's great timepiece, it is a second. But there is a sundial that says: "It's later than you think."

Once, long before man, it was size that counted. A little animal only a foot long, which has been popularly called Leaping Lena, founded a dynasty of giant creatures that could reach leaves three stories above the ground.

If we could have watched the growth of the dinosaurs through 140 million years, we might have believed that size and strength alone were most desirable for success. But Nature had something else in store—something that was to wipe the giants from the earth, almost as if they had never lived.

It became common for a small animal to win over a large one. In a limited sense, the meek inherited the earth. Actually, a better nervous system was evolving. Evolution was laying the foundations for the creature that talks, laughs, plans, and calls himself master of the world—the creature that invents, chooses, and learns from books—the creature whose mysterious desires can bring him close to God and whose pride can cast him lower than the beast.

This creature shivered his way through half a million years before he discovered how to make fire. It took him almost as long again to make a good machine to put it out.

Evolution teaches that three things are necessary to produce change—Variation, Selection, Transmission. If all of Leaping Lena's children had been alike, there could have been no change. But anyone who has raised dogs knows that there are variations in every litter. In the wild, some young are better able to survive the hazards of life—are stronger, swifter, more gifted in the arts of concealment. So a process of natural selection takes place. The ones better fitted to meet life's conditions are more apt to survive to maturity. And some that reach maturity are more likely to secure a mate, produce their kind, and transmit their effective traits to the next generation.

There is a comparison between this kind of evolution—organic evolution—and cultural evolution.

The difference is that cultural evolution refers to all the tools that man uses and all his laws and social institutions. These are not passed on by heredity but chiefly through books and spoken tradition.

In cultural evolution, *invention* plays the part of *variation*. *Choice* takes the place of *natural selection*. And a lot of things that might be bunched together under '*education*' take the place of *transmission* and keep alive the tools and customs we judge desirable. They form the design for to-morrow. The design is the heritage we leave our children.

So we have Invention, Choice, Design.

Speech was the first great achievement that put man on the road to cultural evolution. It permitted the transmission of powers from parent to child without heredity. Written language greatly quickened the process, because it took the burden off memory.

Man now has a multitude of machines to help him build new machines. He even has electronic 'brains' to solve mathematical problems.

In the last 50 years, science has given us the motion picture, the airplane, radio, poison gas, television, radar, jet propulsion, atomic power, antibiotics and the tools of bacterial warfare.

In the next 50 years, science will give us things that will prolong life and things that will shorten it, things that will appeal to your highest nature and to your lowest. But no one can tell what the world will be like, because it's for you to choose.

We are beginning to see that our skill in choosing falls far behind our inventive talent. We find ourselves driving a 100-mile-an-hour car with a 10-mile-an-hour steering wheel.

Whether we shall spiral upward or downward will depend upon this process called Choice. As long as there is freedom of judgment, it is up to you to choose. Scientists will help us beyond their role of inventing and testing new paths. They will advise. But the choice must be yours.

Focussed on this vital act of choice are two powerful forces. One is the creed that Might Makes Right. The other is the belief that the Strong Shall Help the Weak. One feeds on hate, the other on love. One is destructive, the other creative. One breeds strife, the other peace. They are at opposite poles. You can't very well believe in both at the same time.

Science will give us miracles. We shall need also the miracle that raises us above our creature origin. Science can plant two seeds where there was one. So can the thief grow more vicious, the larger the loot.

* By courtesy of the *Natural History Magazine*—An Editorial written on its 50th Anniversary.

It tires man to fix his calendar to the seasons and his timepiece to the stirring of life in a tiny cell. The wheels can be spread on the laboratory table, but who can yet put them together? We plant the seed in the field and then must wait obedient to natural law. Before God, can we show surprise if, after sowing atoms and confessing no regret, we are to reap them ?

We are all one with the earth and shall return to it. The slum-child pressing its cheek to the fresh grass. A man going home to the mountain.

Invention-Choice-Design. For good or ill, these are the handmaidens of our destiny. When Choice becomes Moral Responsibility, Invention becomes Inspiration, and the Design is full of Hope.

It's for you to choose.

Two wars leave us in pain, and the world is sick. Black, white, yellow, red—each in his Maker's image: each exalted, each tempted. At home we deny our brother, while we add new strength to the old weapon. We were born in the day but have defiled our place in the sun. Those born in the night reach for our hand but do not find it; and a cloud rolls in, low over the earth.

Our brief time here has been a wedding of Hate and Power. In this union, dare we pray for the daughters of Love-Moral Responsibility Inspiration, Hope?

Having brought ourselves to the edge of Eternity, dare we not pray for them ?

## TECHNICAL ASSISTANCE: A TWO-WAY TRAFFIC*

NEVER before has the earth been a whole, as it is today, nor has it appeared so to as many people. Slowly, everywhere men and women, often unwillingly it is true, are coming to understand that peoples cannot be free of one another.

This understanding is the basis of what has come to be called the "technical assistance programme" of the United Nations and such specialized agencies as the Food and Agricultural Organization and the United Nations Educational, Scientific and Cultural Organization. Sooner or later, depending upon economic pressure from peoples, the world will function as one.

Reluctantly, even the prosperous are beginning to understand that "backward peoples" must be educated, the undeveloped areas developed, if not for their own sake, then for the sake of those who wish to maintain their present standards of living. Countries such as the United States, which produce more than their people can buy, at least at present prices, must be able to sell to outside peoples, and those peoples must be educated to the point of wanting the new goods, and developed to the degree of being able to buy them. Crudely put, this is the vague idea behind much of the planning today.

Once begun, we may trust to the peoples, however backward they may be considered, to shape the process as it goes on, and in that shaping we shall all be modified. It will be impossible to have the Chinese peasant educated without his also educating us. The Chinese have educated more people than have ever educated them. India has already shown the unconquerable independence of her mind and spirit.

In the contact that is now inevitable between the peoples of Occident and Orient, the greatest change will come in the Occident. It will not be so visible, at first, as the change in the Orient. A refrigerator is a monstrously visible thing, but the change in a man's attitude toward life is far more important and powerful.

Nearly everyone recognizes that in all countries there are spots of modern civilization, individuals of profound culture. There is no lack of admiration for these, no unwillingness to grant their superiority. In the average American, for example, there is today a humility almost touching toward such figures as Gandhi and Nehru.

We must not think that the people sometimes spoken of as 'backward' consider themselves so for one moment. Having achieved the height of sophistication, which is the ultimate in simplicity, it is not likely that the ancient peoples of the East will allow their ordered lives to become confused by machinery not adapted to their needs.

While I do not believe that there are any backward peoples, I know that there are great undeveloped areas in our world. The emphasis needs to be put upon the development of these areas, physically, in communications, food and public health; mentally, in literacy and cultural interchange, and spiritually, in mutual understanding and willingness to sacrifice. I know, too, that there is the means for this development, and it is simple in action. This is the purpose and meaning of "technical assistance".

* From an article by Pearl S. Buck, by courtesy of the *Courier*.

# FORRESTER'S FORMULA FOR THE DETERMINATION OF CALORIFIC VALUE OF INDIAN COALS

V. ARAVAMUTHAN AND S. S. GHOSH
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RESULTS of proximate analysis like ultimate ones have been employed for calculating the calorific value of coals, and from time to time various formulæ have been proposed for the purpose. Forrester[1] proposed a formula specially for coals of Raniganj and Jharia fields as follows:—

$$C_g = 80{\cdot}8\ C + KV,$$

where $C_g$ = calories per gram
C = fixed carbon per cent
V = volatile matter per cent
and K is a factor which varies from 86·5 to 103·25 for various seams.

The calorific values of nine representative samples of Indian coals obtained from Bengal and Bihar fields through official sources were determined by Bomb method and the values compared with those calculated from Forrester's formula applying as far as possible correct 'K' values for respective seams proposed by Forrester as given below.

As shown in Table I, wide differences have been noticed between the two values for each sample. It is, however, interesting to note that, in general, with increasing ash content the difference between the observed and calculated values goes on increasing. Although there is fair justification in accepting the figure 80·8 as the calories contributed by each 1% of fixed carbon present in one gram of coal,* the reason for this wide difference may be attributed to the empirically derived values of 'K', and as such, they are to be accepted with reserve.

| Seams .. | 5, 6, 7 | 10 | 11 | 12 | 13 | 14 & 14 A | 15 | 16 | 17 & 18 | Raniganj |
|---|---|---|---|---|---|---|---|---|---|---|
| K = .. | 103·25 | 95·53 | 98·35 | 97·2 | 96 | 97·75 | 94·5 | 94 | 90·5 | 86·5 |

TABLE I

| Sample No. | Source | Proximate Analysis (oven-dry coal) | | | Calorific value (oven-dry coal) calories per gram | | Difference |
|---|---|---|---|---|---|---|---|
| | | Volatile matter % | Fixed carbon % | Ash % | Experimental by Bomb method | Calculated by Forrester's Formula | |
| 1 | Raniganj Series, Dishergarh Seam, Saltore Colliery | 38·16 | 47·95 | 13·89 | 7218 | 7175 | 43 |
| 2 | Raniganj Series, Dishergarh Seam, Parbelia Colliery | 36·93 | 48·89 | 14·18 | 6955 | 7145 | −190 |
| 3 | Jharia Field, New Jeenagora Colliery, Seam No. 6 in Geological order | 22·70 | 56·92 | 20·38 | 6667 | 6943 | −296 |
| 4 | Jharia Field, New Jeenagora Colliery, Seam Nos. 5 and 6 in Geological order | 21·75 | 52·87 | 25·38 | 6211 | 6518 | −307 |
| 5 | Jharia Field, Central Jeenagora Colliery, Seam Nos. 6 and 7 in Geological order | 22·73 | 55·69 | 21·58 | 6542 | 6847 | −305 |
| 6 | Jharia Field, North Borari Colliery, Seam No. 10 (3rd section) | 22·66 | 52·42 | 24·92 | 6185 | 6394 | −109 |
| 7 | Jharia Field, North Borari Colliery, Seam Nos. 5 & 6 in Geological order | 17·15 | 43·43 | 39·42 | 4833 | 5280 | −457 |
| †8 | Jharia Field, Khas Kusunda Colliery, No. 8 Seam, Bottom section | 18·48 | 64·74 | 16·78 | 6998 | 7139 | −141 |
| †9 | Jharia Field, Central Keshalpur Colliery, Nos. 8 and 9 Seams | 17·51 | 61·40 | 21·09 | 6571 | 6769 | −198 |

* Calorific value of carbon being taken as 8080 calorie per gram.

† 'K' values for seams 8 and 9 are not given by Forrester. We have taken average figure between those of 5, 6, 7 seams and 10 seam.

Obviously, the values of 'K' were derived by Forrester on the assumption that for a seam the volatile matter has the same composition everywhere and hence the same calorific value. This is not correct since the amounts of vitrain, durain and fusain materials vary from place to place in the same seam[2] and even at one spot when traversed from floor to roof.[3] Another important factor which has generally been overlooked is the error introduced by inert ingredients such as (*a*) occluded gases in coal, (*b*) moisture from mineral matters and (*c*) product of decomposition of pyrites, which escape during volatile matter determination. The errors of volatile matter naturally appear in the ash. In other words, the ash 'as found' gives a lower figure than the true mineral matter in the coal. The necessary correction according to Parr[4] will be

Mineral matter = Ash × 1·08 + ·55 sulphur

or volatile matter 'as found' should be decreased by 8% of the 'as found ash' plus ·55 times total sulphur in coal.

Although Parr's correction is not mentioned with any special reference to Indian coals, Forrester's formula was applied after introducing Parr's correction to volatile matter. From Table II it is clear that even by making the aforesaid correction appreciable difference exists, though reduced in magnitude, between the calculated and determined values. In case of four samples, however, the values are in close agreement.

Hence it is suggested that a correction similar to that of Parr's on volatile matter must be applied before any calculation of calorific value is attempted by the use of any formula such as Forrester's. Parr's correction may not be applicable as such to Indian coals owing to the high percentage of ash they contain and the difference in the mineral matter composition from British and American coals. Reliable data on the nature of mineral matter and also the composition of volatile matter for various seams at different places must be available to make use of any empirical formula based on proximate analysis. Investigations in obtaining such useful data are in progress.

TABLE II

| Sample No. | Oven dry coal | | Correction to be applied to Vol. matter (according to Parr) | Corrected Vol. Matter % | Calorific value by Forrester's formula on Corrected Vol. Matter | Difference between Experimental and Calculated Figures |
|---|---|---|---|---|---|---|
| | Ash % | Total sulphur % | | | | |
| 1 | 13·89 | 0·33 | −1·30 | 36·86 | 7063 | 155 |
| 2 | 14·18 | 0·29 | −1·30 | 35·63 | 6952 | 3 |
| 3 | 20·38 | 0·46 | −1·89 | 20·81 | 6748 | − 81 |
| 4 | 25·38 | 0·41 | −2·26 | 19·49 | 6284 | − 73 |
| 5 | 21·58 | 0·31 | −1·90 | 20·83 | 6650 | −108 |
| 6 | 24·92 | 0·46 | −2·25 | 20·41 | 6185 | nil |
| 7 | 39·42 | 0·28 | −3·31 | 13·85 | 4938 | −105 |
| 8 | 16·78 | 0·34 | −1·53 | 16·95 | 6981 | 17 |
| 9 | 21·09 | 0·36 | −1·89 | 15·62 | 6574 | − 3 |

The assistance rendered by the office of the Coal Commissioner for India in the collection of samples with every available details is thankfully acknowledged.

1. Forrester, C., *Colliery Guardian*, 1932, **145**, 382-84. 2. —, *Trans. Min. Geol. Inst. India*, 1932, **26**, 277-301. 3. —, *J. Inst. Fuel*, 1935, **9**, 30-58. 4. Parr, S. W., *J. Ind. Eng. Chem.*, 1922, **14**, 919-22.

## FULBRIGHT TRAVEL GRANTS

AS already announced, the United States Educational Foundation has been established in India, New Delhi, to finance certain educational exchange programmes under the Fulbright Agreement. The Government of the United States of America will make available necessary funds in Indian currency to finance various schemes. The amount set aside will be utilised partly for providing free transportation to selected Indian nationals who wish to attend United States educational institutions of higher learning in the United States, Hawaii, Alaska (including the Aleutian Islands), Puerte Rico and the Virgin Islands.

Indian nationals wishing to qualify for travel grants under the Fulbright Agreement should apply direct to the Executive Secretary, the United States Educational Foundation, American Embassy, Queensway, New Delhi. The applications should be made in the prescribed form available from that office.

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## ABSORPTION SPECTRA OF THALLIUM HALIDES

The absorption spectra of Tl I, TlCl and TlBr have been investigated in the region λ6500–λ2200. An examination of the new absorption photographs obtained for Tl I in the present work, has led to an important modification in the analysis of the main system $^3\Pi - {}^1\Sigma^+$ reported by the author and K. R. Rao,[1] earlier in emission. The origin had to be located at $\nu 26339{\cdot}6$ instead of at $\nu 25780{\cdot}0$ and the vibrational quantum numbers $v'$ and $v''$ had to be increased by 11 and 13 units respectively. The revised vibrational constants are

$$\nu_e = 26361{\cdot}7 \quad \omega_e' = 93{\cdot}4 \quad \omega_e'' = 123{\cdot}5 \quad x_e'\omega_e' = 0{\cdot}10 \quad x_e''\omega_e'' = 0{\cdot}09$$

No systems of Tl I attributable to the transitions $^3O^+ - {}^1\Sigma^+$ and $^1\Pi - {}^1\Sigma^+$ have been obtained in absorption.

The two systems of TlCl lying between λ4200 – λ3800 and one for TlBr in the region around λ3950 analysed by the author[2,3] from emission photographs have not occurred in absorption.

Andhra University, Waltair, P. Tiruvenganna Rao.

*April* 20, 1950.

1. Tiruvenganna Rao and Rao, K. R., *Ind. Jour. Phy.*, **1949, 23,** 185. —, *ibid.*, 1949, **23,** 393. 3. —, *ibid.*, 1949, **23,** 425.

## MICRO-FOSSILS FROM THE BAGH BEDS OF BARWAHA NEAR INDORE

Our knowledge of the marine Cretaceous Bagh fauna of the Narbada valley is confined only to the mega-fossils: Echinoids were described by Duncan[1]; Ammonites by Verdenburg[2] and Bose[3]; Bryzoa, Echinoids, Rhynconellids, Lamellibranchs and Ammonites by Chiplonkar.[4] These authors considered the fauna to be Cenomanian in age. Fourtau[5] who

re-examined the Echinoids came to the conclusion that they were Albian in age. Micro-palæontological examination of the collection from the khalar river cutting east of Yelam (Lat. 22° 10′ : Long. 76° 1′) near Barwaha has shown the presence of foraminifera and calcareous algæ, which are both important in fixing the age of the beds.

The sequence of the rocks is as follows:—

(5) Traps with Intertrappeans containing *Physa prinsipii*.

(4) Coralline limestone with a sandstone parting in between.

(3) Upper Gondwanas (exposed around Ghatia and Katkut).

(2) Bijawar limestones (exposed around Barwaha and east of Agarwara).

(1) Archæans (exposed east of Barwaha).

The material that has yielded the micro-fossils belongs to the upper band of the calcareous limestone. In hand specimen the limestone is arenaceous with a calcareous matrix and remains of Bryozoa and Corals predominate.

Thin sections of the coralline limestone show the following micro-fossils :—

Algæ — *Neomeris* sp. (Fig. 1).
*Archæolithothamnium* sp. (Fig. 2).

Foraminifera — *Globorotalia* sp.
*Globigerina* sp.

*Neomeris* sp.—Fragments of the Dasycladaceæ *Neomeris* are found showing sporangia with two secondary branches characteristic of the genus. The thickness of the shell is 0·25 mm.; sprongial diameter 0·136 mm. with stalk

FIG. 1. *Neomeris* sp. × 65. *Loc.*—Barwaha uear Indore

0·2 mm.; the diameter of the secondary branches is ·05 mm. Measurement indicates that the species is different from those described from Rajahmundry[6] and Trichinopoly.[7] The geological record of *Neomeris* does not go below the Upper Cretaceous.

*Archæolithothamnium.*—The family Corallinace is represented by the genus *Archæolithothamnium*, which shows the conceptacles, ovoid, isolated and arranged in zones, and the perithallial and hypothallial cells.

Among the foraminifers *Globorotalia* and *Globigerina* are present. The genus *Globorotalia* first appears in the Cenomanian.[8]

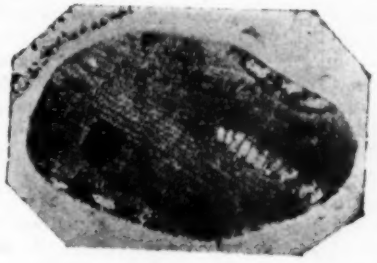

FIG. 2. *Archæolithothamnium* sp. × 45. *Loc.*—Barwaha near Indore

The presence of *Neomeris* and *Globorotalia* suggests that the Bagh limestones collected cannot be older than the Cenomanian. A more detailed report is under preparation.

The author is indebted to Prof. S. R. N. Rao for his guidance.

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Dept. of Geology,
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Lucknow,
*April* 13, 1950.

1. Duncan, *Q. J. G. S.*, 1865, **21**, 357. 2. Vreenburg *Rec. Geol. Surv. Ind.*, 1907, **36**, 109. 3. Bose, *Mem. Geol. Surv. Ind.*, 1884, **21**, 35. 4. Chiplonkar, *Proc. Ind. Acad. Sci.*, 1938, **7**, 300–16; **9**, 236–46; **10**, 98–109, 255–74; **15**, 148–52. 5. Fourtau, *Rec. Geol. Surv. Ind.*, 1865, **21**, 36 ff. 6. Pia, S. R. N., and Rao, K. S., *Sitz. d. Akad. d. Wiss.* Vienna, 1937, **146**, 227–36. 7. Rama Rao and Pia, *Pal. Ind., N.S.*, 1936, **21**, 4. 8. Glæssner, "Principle of Micro-Palæontology," 1944.

## ON A SMALL COLLECTION OF PLANT FOSSILS FROM SAURASHTRA

A SMALL collection of plant fossils was made by one of us (K. P. V.) from *Tartar* and *Dhuli*, two villages about 8 and 25 miles respectively from *Than* Railway Station in Saurashtra. So far as we are aware no plant fossils have been reported from these localities although from Sonegarh, a place about 8 miles away, the following plant impressions have been recorded by F. Fedden[1]: *Pecopteris* sp., *Tæniopteris* sp., *Podozamites lanceolatus*, and *Echinostrobus expansus*. Our collection shows the following impressions.

*Tartar.*— The plant fossils in this locality were all found *in situ* in black ferruginous

shales, forming a part of a fossiliferous bed more than 6 feet in thickness. The impressions are not very well preserved but in many places a little of the carbonised material is still preserved. Attempts to macerate these to recover cuticles or spores have failed so far. The impressions have been identified as far as the imperfect preservation permits, as follows:

*Sphenopteris* sp.—There are at least six different types of leaves that can be referred to this form genus, but so far only fragmentary specimens have been found and it has not been possible to institute any definite comparisons.

*Cladophlebis whitbyensis.*

*Cladophlebis* sp.—Here too nearly eight different kinds of fronds are recognised. It is likely that they represent different forms of the same species, but even here, their fragmentary nature and badly preserved venation prevent further comparisons.

*Brachyphyllum* sp.—Possibly *Br. mamillare* (Brong). Several well branched specimens of this are present.

*Araucarites cutchensis* (Fst.).—Cone scales referred to this species, are intermediate in size between those of *A. cutchensis* and *A. macropteris.* But as their general form is more like that of *A. cutchensis* and in the absence of any other distinguishing characters, we prefer to keep them under this species itself. The frequent association in some of our rock specimens of *A. cutchensis* and the above referred species of *Brachyphyllum*, to the complete exclusion of any other plant remains, rather temptingly suggests that the two might possibly be the reproductive and vegetative parts respectively of the same conifer.

A small conifer shoot with spirally arranged leaves closely resembling *Elatocladus plana* Fst. is also present.

*Dhuli*:—

Impressions of only *Cladophlebis indica* O & M sp. have been found in whitish clay, dug out of a well.

A fuller paper on this collection which is being worked out, will be published elsewhere. This investigation was supported by a grant from the Scientific Research Committee of the U.P. Government.

Dept. of Botany & Geology, Lucknow University, *April* 1950.

A. R. RAO.
K. P. VIMAL.

1. Fedden, F., "Geology of Kathiawar," *Mem. Geol. Surv. Ind.*, **21**, Part 3, p. 81.

## $B_{12}$ CONTENT OF MOLDY BRAN AND BROOD LAC EXTRACTS

IN the course of our studies on the microbiological assay of the B complex vitamins of aqueous extracts of moldy bran and brood lac, it was found that they contained some growth factors other than those shown to be present when the "all-vitamin" medium was employed for assaying.[1-2] Addition of the moldy bran extract in concentrations corresponding to 20 mg. of nitrogen of the extract per 100 ml. of the "all-vitamin" medium gave a 20-25% increase in acidity.

The presence of $B_{12}$ and its functionally related compounds have been tested for their presence in the extracts with the aid of the lactic culture, *L. lactis* Dorner, kindly supplied to us by Drs. Kocher, and K. K. Iya.* The response was strikingly positive and preliminary estimates reveal the presence of 1·6 mγ $B_{12}$ activity per c.c. of moldy bran extract and 0·17 mγ per mg. nitrogen of lac extract. The data are computed from a standard curve which was obtained by using a solution of crystalline $B_{12}$. Compared with liver extract, however, the moldy bran extract contains only 0·148 of the $B_{12}$ potency of the latter. The differential test for thymidine and $B_{12}$ has not yet been made. The details of the investigations, now under progress, will be reported elsewhere. Our grateful thanks are due to Merck & Co., New York, for the gift of $B_{12}$ (Cobione) ampoules.

Fermentation Technology, Indian Inst. of Science, Bangalore, *June* 10, 1950.

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M. SREENIVASAYA.

*Obtained from Lederle Labs., Pearl River, New York.

1. Mistry, S. P., and Sreenivasaya, Unpublished data.
2. Raghavendra Rao, M. R., Mistry, S. P., and M. Sreenivasaya, *J. Sci. Ind. Res.*, 1948, **7B**, 116.

## INFLUENCE OF ADSORPTION OF $FeCY_6'''$ AND $Cd^{\cdot\cdot}$ IONS, AND THAT OF HYDROLYSIS ON THE COMPOSITION OF CADMIUM FERRICYANIDE

THE composition of cadmium ferricyanide had been studied by conductometric and thermometric titrations.[1] The variations in the titre values suggested the following study to assess the part played by hydrolysis and adsorption in the precipitation of cadmium ferricyanide.

Fairly stable sol of strength 2·5 gm./litre was prepared by mixing cadmium sulphate and potassium ferricyanide solutions in the molar proportions 1 : 5/4. The sol was dialysed for

5 days, and mixed with cadmium sulphate and potassium ferricyanide solutions respectively, at several concentrations, and $FeCy_6'''$ and Cd adsorbed per gm. of the precipitate was determined.

Dilution effect on the sol in respect of the released $FeCy_6'''$ was also studied by coagulating it with A.R. ammonium sulphate, on determining the amount of $FeCy_6'''$ in the supernatant solution.

The accompanying curves show that the release of $FeCy_6'''$ per gm. of the complex is much greater in the undialysed sol than in the

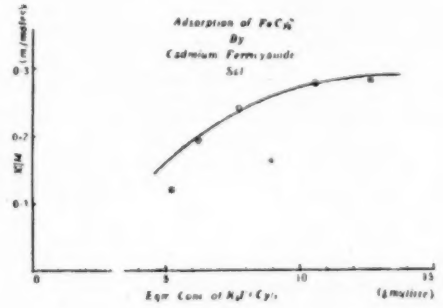


FIG. 1

dialysed ones. Gradual increase of $FeCy_6'''$ released on dilution of the sol, suggests that the sol suffers hydrolysis to some extent.

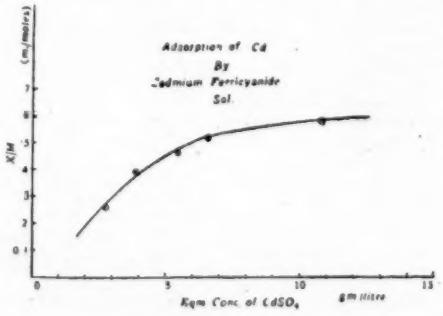


FIG. 2

There is a definite increase in the concentration of $FeCy_6'''$ on successive dilutions even when the sol has been dialysed for 4 days.

The conditions of conductometric and thermometric titrations (*loc. cit.*) are similar to those for the formation of an undialysed sol, for one of the reactants is added in excess until the precipitate assumes the colloidal form. From the quantitative estimations of

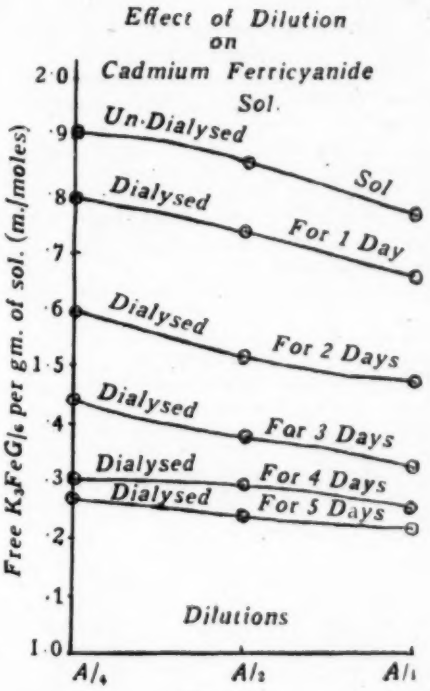


FIG. 3

hydrolysis and adsorption it is obvious that the variations in the composition of the compound are caused by both the factors.

Chemistry Department, HARISH CH. GAUR.
Agra College, A. K. BHATTACHARYA.
Agra,
*March* 28, 1950.

1. Bhattacharya and Gaur, *J. Ind. Chem. Soc.*, 1948, **25**, 349, 1949, **26**, 46.

## STUDIES IN ANTIMALARIALS

### Biguanido-aryl-sulphides and sulphones

FOLLOWING the discovery of the unique antimalarial properties of Paludrine[1], many attempts have been made to improve upon the activity of the parent drug.[2,3,4,5,6,7,8,9,10] Considering that a suitable substituted biguanide system may be sufficient for antimalarial activity,[11] we have prepared a series of $N^1$-$N^5$-aryl substituted biguanides as possible antimalarials, by replacing the isopropyl group in paludrine and its bromoanalogue with chemotherapeutically active residues of 4-nitro-4′-amino diphenyl sulphide, 4-nitro-4′-amino diphenyl sulphone,

4, 4′-diamino diphenyl sulphide and 4, 4′-diamino diphenyl sulphone.[12,13,14,15]

TABLE A

N′—N⁵—diaryl biguanides

RNH—C (=NH)—NH—C (=NH)—NHR′, HCl

| No. | R | R′ | M.P. °C. |
|---|---|---|---|
| I | *p*-$NO_2$-$C_6H_4$-S-$C_6H_4$- | H | 236-87 |
| II | do | *p*-Cl·$C_6H_4$-- | 224-26 |
| III | do | *p*-Br·$C_6H_4$-- | 220-22 |
| IV | *p*-$NO_2$-$C_6H_4$-$SO_2$-$C_6H_4$- | H | 238-39 |
| V | do | *p*-Cl-$C_6H_4$ | 207-8 |
| VI | do | *p*-Br-$C_6H_4$- | 223-25 |

TABLE B

4, 4′-Di (N′—aryl) biguanido diphenyl sulphide and sulphone

RNH—C (=NH)—NH—C (=NH)—NH
RNH—C (=NH)—NH—C (=NH)—NH > R′

where R′ = $-C_6H_4-S-C_6H_4-$ and $-C_6H_4-SO_2-C_6H_4-$

| No. | R | R′ | M.P. °C. |
|---|---|---|---|
| I | H- | $-C_6H_4-S-C_6H_4-$ | 244 |
| II | *p*-Cl-$C_6H_4$- | do | 224-26 |
| III | *p*-Br-$C_6H_4$- | do | 232-33 |
| IV | $C_6H_5$- | do | 252-53 |
| V | *p*-$CH_3$-$C_6H_4$- | do | 192-93 (base) |
| VI | H- | $-C_6H_4-SO_2-C_6H_4-$ | 252 (deeomp.) |
| VII | *p*-Cl·$C_6H_4$- | do | above 325 |
| VIII | *p*-Br-$C_6H_4$ | do | 278 |

Table A lists the products of condensation of arylcyanoguanidines with the appropriate arylamine hydrochloride by heating in equimolecular proportions in dimethylaniline at 120-40° C. for 2-4 hrs. The reaction products crystallised out as hydrochloride from the hot solvent. For the synthesis of compounds given in Table B, pyridine was used in place of dimethylaniline as solvent.

The chemotherapeutic activities (antimalarial and antitubercular properties) of the compounds are being tested.

Full details will be published elsewhere.

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*April* 3, 1950.

1. Curd and Rose, *J. Chem. Soc.*, 1946, 729. 2. Gupta, Iyer and Guha, *Curr. Sci.*, 1948, **17**, 53. 3. Indem, *ibid.*, 1948, **17**, 185. 4. Personal communication. 5. Roy, Iyer and Guha, *Curr. Sci.*, 1948, **17**, 126. 6. Bami Iyer and Guha, *J. Indian Inst. Sci.*, 1947, **29A**, 16. 7. —, *ibid.*, 1948, **30A**, 1. 8. —, *Curr. Sci.*, 1947, **16**, 386. 9. —, *J. Indian Inst. Sci.*, 1947, **27A**, 15. 10. —, *Curr. Sci.*, 1949, **18**, 50-52. 11. Curd and Rose, *Nature*, 1946, **158**, 707. 12. Buttle *et al.*, *Lancet*, 1937, **1**, 1331. 13. Raiziss, *et al.*, *J. Amer. Chem. Soc.*, 1939, **61**, 2763. 14. Richard, *et al.*, *ibid.*, 1941, **63**, 1930. **63**, 15. Feldman, *et al.*, *Proc. Staff Meet. Mayo Clinic*, 1940, **15**, 694; 1941, **16**, 787.

## THE INFLUENCE OF MANGANESE ON THE METABOLISM OF RATS AND ITS ALLEGED LIPOTROPIC ACTIVITY

THE importance of manganese in the prevention of perosis of chicks has been amply demonstrated,[1-4] while its importance in the development of the bones of rabbits and to a much lesser extent, of the bones of rats, has also been shown by several workers.[7-10]

TABLE I

*Influence of Zinc and Manganese on the Metabolism of Rats.*

| | Control | Zinc supplemented | Manganese supplemented |
|---|---|---|---|
| Food intake (gm.) .. | 94·1 | 90·4 | 100·8 |
| Increase in weight (gm.) .. | 0·5 | 0·5 | 7·0 |
| Uric acid in urine (mg.) .. | 6·046 | 3·532 | 6·145 |
| Creatinine in urine (mg.) .. | 15·552 | 10·507 | 18·734 |
| Total creatinine (mg.) .. | 17·555 | 14·689 | 21·167 |
| Nitrogen : (mg.) | | | |
| Urinary .. | 191·55 | 127·38 | 252·09 |
| Fæcal .. | 137·19 | 205·41 | 164·49 |
| Retention .. | 830·56 | 793·60 | 740·61 |
| Phosphorus : (mg.) .. | | | |
| Urinary .. | 93·27 | 52·84 | 114·06 |
| Fæcal .. | 49·82 | 169·42 | 85·20 |
| Retention .. | 327·41 | 204·44 | 284·94 |
| Liver Analysis : | | | |
| Fresh weight of liver (gm.) | 5·968 | 4·965 | 6·545 |
| Fat content (gm.) .. | 1·281 | 0·785 | 1·533 |
| Fat per cent. .. | 21·43 | 15·81 | 23·03 |
| Bone Analysis: | | | |
| Dry weight of femurs (gm.) | 0·3615 | 0·3348 | 0·3723 |
| Ash weight (gm.) .. | 0·1801 | 0·1583 | 0·1915 |
| Ash per cent. .. | 48·76 | 47·42 | 51·53 |
| Calcium (Ca) (mg.) .. | 66·15 | 56·66 | 69·21 |
| Phosphorus (P) (mg.) .. | 38·05 | 33·05 | 39·90 |

Jukes[5] and Jukes and Bird[6] also showed that perosis is caused by a dietary deficiency of choline and of biotin.

Amdur, *et al.*,[11] have reported that manganese also possesses lipotropic activity. In view of the earlier reports [12,13] that zinc possesses lipotropic activity and that it brings about poor development of the bones in rats by interfering with general metabolism, it was of interest to find out the influence of manganese on metabolism, fat content of liver and the development of the bones of rats fed on a high

fat, low protein diet, designed to produce fatty infiltration of liver. The supplements of zinc and manganese were made as 500 mg. per cent. of zinc oxide and 150 mg. per cent. of manganese chloride. These results are presented in Table I, which indicates the total for an experimental period of 21 days, divided into periods of three days each.

The results show that the influence of manganese on metabolism is almost just the opposite of that of zinc. The metabolism of both nitrogen and phosphorus is appreciably greater than in the other two groups and this appears to be made up by an increase in the food intake. There appears to be no evidence of a lipotropic activity of manganese, at least under the conditions of the present investigation, nor any marked improvement in bone development. The excretion of uric acid and of creatinine showed that manganese increased their output while zinc decreased it.

Details will appear elsewhere.

Haffkine Institute, V. SADASIVAN.
Bombay,
*March* 10, 1950.

1. Wilgus, H. S. (Jr)., Norris, L. C., and Heuser, G. F., *J. Nutrition*, 1937, **14**, 155. 2. Lyons, M., Insko, W. M., (Jr.), and Martin, J. H., *Poultry Sci.*, 1938, **17**, 12; 264. 3. Gallup, W. D., and Norris, L. C., *Science*, 1938, **87**, 18. 4. Caskey, C. D., Gallup, W. D., and Norris, L. C., *J. Nutrition*, 1939, **17**, 407. 5. Jukes, T. H., *Ibid.*, 1940, **20**, 445. 6. —, and Bird, F. H., *Proc. Soc. Exper. Biol. and Med.*, 1942, **49**, 231. 7. Barnes, L. L., Sperling, G., and Maynard, L. A., *Ibid.*, 1941, **46**, 562. 8. Shils, M. E., and McCollum, E. V., *J. Nutrition*, 1943, **26**, 1. 9. Smith, S. E., Medlicott, M., and Ellis, G. H., *Arch. Biochem.*, 1944, **4**, 281. 10. Amdur, M. O., Norris, L. C., and Heuser, G F., *Proc. Soc. Exper. Biol. and Med.*, 1945, **59**, 254. 11. —,—, —, *J. Biol. Chem.*, 1946, **164**, 783. 12. Sadasivan, V., *Curr Sci.*, 1950, **19**, 10. 13. *Ibid*, 1950, **19**, 129.

## A RAPID METHOD FOR ESTIMATION OF LEAF AREA IN GROWING MAIZE PLANTS

A METHOD of leaf area determination in barley described in another paper* leads to the formula

$$\text{Log } \Sigma A = \text{Log } \Sigma L + \text{Log } \Sigma B - \text{Log } K - \text{Log } N$$

which gives the total leaf area within three percent of the actual.

Leaf area in maize leaves is also found to be similarly related to the length and width of blade. The ratio $\left(\frac{\text{Length} \times \text{breadth}}{\text{Area}}\right)$ was found to vary between 1·18—1·54 with an average of 1·32 for the total population of leaves. This leaf factor K is related to other leaf characters by the formula

$$A = \frac{L \times B}{K} \qquad (1)$$

or, $$\text{Log } A = \text{Log } L + \text{Log } B - \text{Log } K, \qquad (2)$$

where A = leaf area of one surface, B = width of leaf in the middle of blade, L = length of leaf and K = leaf factor 1·32.

The total area on the plant can be had by measurement of total length ( $\Sigma L$ ) and total width ($\Sigma B$) of all the N leaves, from equation:

$$\Sigma A = \frac{\Sigma L \times \Sigma B}{K \times N} \qquad (3)$$

or, $$\text{Log } \Sigma A = \text{Log } \Sigma L + \text{Log } \Sigma B - \text{Log } K - \text{Log } N \qquad (4)$$

Use of formula (2) for the individual leaf area or formula (4) for the total leaf surface involve an experimental error of 1·9 and 6·6 per cent. respectively. These formulæ are well adapted to the needs of biological

TABLE I

*Relation between length and width of leaf and leaf area (all in cms.)*

| No. | Area in sq. cm. | Length cm. | Breadth cm. | Length × Breadth | Leaf Factor K | Calculated area (sq. cm.) |
|---|---|---|---|---|---|---|
| 1 | 394·2 | 64·9 | 8·6 | 558·1 | 1·41 | 422·8 |
| 2 | 332·8 | 56·8 | 7·7 | 437·3 | 1·31 | 331·3 |
| 3 | 250·8 | 61·5 | 6·3 | 387·4 | 1·54 | 293·4 |
| 4 | 249·2 | 48·7 | 6·7 | 326·3 | 1·30 | 247·2 |
| 5 | 201·2 | 67·8 | 4·2 | 284·7 | 1·41 | 215·7 |
| 6 | 192·0 | 51·5 | 5·0 | 257·5 | 1·34 | 195·0 |
| 7 | 187·9 | 53·5 | 5·1 | 272·8 | 1·45 | 206·7 |
| 8 | 168·8 | 59·5 | 4·2 | 249·9 | 1·48 | 189·2 |
| 9 | 157·0 | 56·8 | 3·8 | 215·8 | 1·37 | 163·4 |
| 10 | 152·7 | 37·7 | 5·0 | 188·5 | 1·23 | 142·8 |
| 11 | 149·2 | 41·3 | 4·6 | 189·9 | 1·27 | 143·9 |
| 12 | 143·3 | 55·0 | 3·1 | 170·5 | 1·18 | 121·6 |
| 13 | 142·3 | 44·3 | 4·3 | 190·4 | 1·33 | 144·2 |
| 14 | 141·6 | 46·4 | 3·9 | 180·9 | 1·27 | 137·0 |
| 15 | 114·5 | 52·4 | 2·8 | 146·7 | 1·28 | 101·1 |
| 16 | 90·8 | 29·2 | 3·8 | 110·9 | 1·23 | 84·0 |
| 17 | 88·7 | 31·1 | 3·5 | 108·8 | 1·22 | 82·4 |
| 18 | 82·0 | 34·0 | 3·2 | 108·8 | 1·32 | 82·4 |
| 19 | 53·4 | 31·0 | 2·2 | 68·2 | 1·27 | 51·6 |
| 20 | 25·2 | 16·2 | 2·0 | 32·4 | 1·28 | 24·5 |
| 21 | 30·1 | 19·0 | 2·1 | 39·9 | 1·32 | 30·2 |
| 22 | 23·9 | 18·0 | 1·8 | 32·4 | 1·35 | 24·6 |
| Total | 3371·6 | 976·6 | 93·9 | 4558·1 | 29·14 | 3435·0 |

Average value of leaf factor K .. 1·32
Percentage error based on formula 2 .. 1·9%
Calculated area based on formula 4 .. 3147·0
Percentage error based on formula 4 .. 6·6%

investigation under field conditions, and are therefore recommended for rapid determination of total leaf area on growing maize plants.

To do this (i) determine the leaf factor K on the sample of 25–30 leaves of different ages as indicated in Table I; (ii) estimate the total length ΣL, and total width ΣB of all leaves on the plant and (iii) apply formula (4) for total leaf surface. The entire estimation is finished within ten minutes. The method does not involve any costly appliance nor does it necessitate the removal of leaves. It is considered more helpful than any other advocated methods for rapid leaf area estimation.

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College of Agriculture, K. N. LAL.
Benares Hindu University, M. S. SUBBA RAO.
*March* 27, 1950.

* Lal, K. N. and Subba Rao, M. S *Sci., and Culture*, 1950, **15**, 355–56.

## STUDIES WITH METHONE: PART I

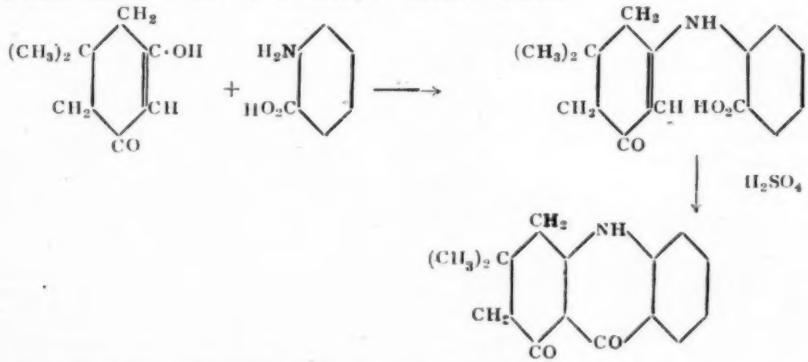
THE present work deals with the condensation of methone [1,2,3,4,5] with anthranilic acids. The first stage of the condensation proceeds smoothly in the presence of absolute alcohol in the case of anthranilic acid, and in presence of dry pyridine in the case of *N*-methyl *N*-phenyl and 4-methyl anthranilic acid, resulting in the formation of corresponding *N*-(3′-keto-5-dimethyl) (-3′-4-4′-5′-6′- tetrahydro) phenyl anthranilic acids. The second stage deals with the cyclisation resulting in the formation of the corresponding hydroacridones effected either by sulphuric acid (80%) or by heating methone and anthranilic acids directly on an oil-bath at 220° for 2 hrs. The yields are generally found good. The intermediate acids are yellow coloured crystals with definite melting points whereas the cyclised products are amorphous and melt at 360°.

The reaction of anthranilic acid and methone can be detailed as shown by the structural formulæ

The phenyl hydrazones, 2 : 4-dinitro-phenyl hydrazones and the esters of the intermediate acid have been prepared and are tabulated below.

| Methone+ | M.P. | Phenyl hydrazone | 2 : 4-dinitro phenyl hydrozone | Ester |
|---|---|---|---|---|
| Anthranilic Acid | | Yellow crystals | Yellow | B.P. 118–20° |
| 1 Uncyclised | 182° | 186° | 206° | |
| 2 Cyclised | 360° | | 225° | |
| N-Me. Anth. Acid | | | | |
| 1 Uncyclised | 185° | 180° | 181° | |
| 2 Cyclised | 350° | 226° | | |
| N-Ph. Anth. Acid | | | | |
| 1 Uncyclised | 200° | 181° | 194° | |
| 2 Cyclised | 350° | 226° | | |
| 4-Me. Anth. Acid | | | | |
| 1 Uncyclised | 206° | 201° | 204° | |
| 2 Cyclised | 310° | 217° | | |

The authors' thanks are due to Professor P. C. Guha for his kind interest.
Org. Chem. Laboratories,
Ind. Inst. of Science, T. S. SIVASWAMI.
Bangalore 3, B. H. IYER.
*March* 27, 1950.




1. Vorlander, *Ann.*, 1897, **294**, 300. 2. Kleni, *et. al., Micro. Chem.*, 1923, Pregl. First 204–34. 3. Chakravarti, *et. al., J. Ind. Inst. of Sci.*, 1931, **14A**, 141–56. 4. —, *Ibid.*, 1931, **14A**, 157. 5. Reed, *J. C. S.*, 1944, 425.

## STUDIES ON LOCAL ANAESTHETICS
### Part I

PREVIOUS work on local anæsthetics was confined for the most part to preparing esters of amino-aryl acids with different substituted alkanalamines. Substitution in the amino-

group of the acid component does not appear to have been tried. The preparation of a few derivatives of novocaine with acid chlorides of dicarboxylic acids is here reported.

Novocaine (2 mol.) was reacted in the cold with the di-acid chlorides (1 mol.) in benzene medium. The hydrochlorides of the resulting products separated out soon from which the bases were obtained by the addition of sodium carbonate solution.

ture of novocaine (4 mol.) and alkylene dibromide (1 mol.) in amyl alcohol for about 12 hours. On removal of alcohol, a dark pasty mass was left behind. It was treated with sodium carbonate solution and the liberated base taken up in benzene. The dry benzene solution on the addition of dry petroleum-ether gave a clear white precipitate.

The compounds are under pharmacological investigation.

TABLE I

| | Acid chloride used | Formula of the compound R = $-C_6H_4COOCH_2CH_2NEt_2$ | m.p. of the base | m.p. of the hydrochloride |
|---|---|---|---|---|
| 1 | Phosgene .. | $CO(NHR)_2$ | 103° | 217-218° |
| 2 | Oxalyl chloride .. | $(CO\cdot NHR)_2$ | 218-19° | Chars without melting above 300° |
| 3 | Malonylchloride .. | $CH_2(CONHR)_2$ | 83° | 149° |
| 4 | Succinylchloride .. | $(CH_2\text{-}CONHR)_2$ | 185° | 230° |
| 5 | Glutarylchloride .. | $(CH_2)_3(CONHR)_2$ | 132° | 172° |
| 6 | Adipyl chloride .. | $(CH_2)_4(CONHR)_2$ | 158° | 185-90° |
| 7 | Phthalylchloride .. | $C_6H_4(CONHR)_2$ | 98° | 118° |

In the cases of (4) and (7), in addition to the normal derivative, a small trace of an insoluble cyclic product was formed by the interaction of one mol. of novocaine with one mol. of the acid chloride melting at 242°-44° and 94° respectively.

The alkylene-bis-novocaine derivatives have been prepared by heating under reflux a mix-

TABLE II

| | Name of the alkylene dibromide | Formula of the derivative | m.p. of the base | m.p. of the hydrochloride |
|---|---|---|---|---|
| 1 | Ethylene dibromide | $C_2H_4(NHR)_2$ | 185° | 240° |
| 2 | Trimethylene dibromide | $(CH_2)_3(NHR)_2$ | 189° | 261° Chars |
| 3 | Tetra methylene dibromide | $(CH_2)_4(NHR)_2$ | 197° | above 270° |
| 4 | Pentamethylene dibromide | $(CH_2)_5(NHR)_2$ | 223° | ,, |

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*April* 10, 1950.

## STUDIES ON LOCAL ANAESTHETICS
### Part II

To study the effect of replacement of the amino-group of novocaine by groups like urea, thiourea, cyanamide, guanidine and aminoguanidine, etc., the following compounds as shown in Table I have been prepared.

The urea derivative (I) is prepared by the action of potassium cyanate on novocaine in excess of dilute acetic acid. The thio-carbamido derivatives (II—VIII) are prepared by condensing the corresponing isothiocyanates with novocaine in a suitable organic solvent. The acetyl and benzoyl thio-carbimides obtained by boiling the acid chlorides with lead thiocyanate in anhydrous benzene, reacting with anhydrous novocaine furnish the corresponding acetyl and benzoyl thioureas (IX and X).

TABLE I

| No. of compound | Formula of the compound R=-$C_6H_4$-$COOCH_2CH_2$-$NEt_2$ | M.P. °C. |
|---|---|---|
| I | $NH_2$-CO-NH-R | 84° |
| II | PhNH-CS-NH-R | 152° |
| III | *p*-Cl. $C_6H_4$-NH-CS-NH-R | 132° |
| IV | *p*-Br. $C_6H_4$-NH-CS-NH-R | 138 (decomp.) |
| V | *p*-I·$C_6H_4$-NH-CS-NH-R | 178 (decomp.) |
| VI | *p*-Me. $C_6H_4$-NH-CS-NH-R | 119 |
| VII | *o*-Me. $C_6H_4$-NH-CS-NH-R | 109 |
| VIII | *m*-Me. $C_6H_4$-NH-CS-NH-R | 103 |
| IX | $CH_3CO$-NH-CS-NH-R | 132 |
| X | PhCO-NH-CS-NH-R | 152 |

The compounds are under pharmacological investigation.

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## ROOT DEVELOPMENT AND YIELD OF *LYCOPERSICUM ESCULENTUM* MILL. VAR. *BEST OF ALL* IN RELATION TO VARYING MOISTURE SUPPLY

BOYNTON (1936) reported that fruit growth was reduced on trees with root system only 2′ deep while trees rooting 4′ deep were unaffected. Water in the third and fourth foot was responsible for maintenance of fruit growth on deeper rooting trees. Magness, Degman and Furr (1935) reported serious difficulties in apple trees rooting to a depth of only 18″. They concluded that since water is lost by evaporation from the soil to depth exceeding 12″, the moisture available for the trees in such a location would be sufficient for a short drought only.

*Materials and Method.*—The experiment under report was laid out statistically for studying the growth and yield of *L. esculentum* var. *Best of All* under four depths of irrigation, *viz.*, ½″, 1″, 2″ and 3″ every fortnightly. For study of root development four plants of uniform size from each treatment were selected.

Direct method of root study was applied. At a convenient width all round the plants to be examined, a ditch was dug to a depth of 5′. The soil around the plant was then gradually washed away by a force pump. As the work of excavation progressed, the trench was deepened if necessary so that, finally the soil underlying the deepest root was removed. As the process continued, detailed notes, careful measurements and drawings were made in the field on a large drawing sheet. In the drawings, the roots were arranged as nearly possible in a vertical plane. Although the drawings were made on a large scale, the rootlets were often so abundant that it was quite impossible to show the exact number. Such drawings, however, represent the extent, position and natural branching of the root system even more accurately than a photograph in which the details of the extensive root system are always obscured.

*Experimental findings :—*

*I. Relation of absorbing area to soil moisture :*

*A. Root development under ½″ irrigation.*—The tap root after entering the soil to a depth of a few inches gave rise to a lateral root which penetrated to a depth of nearly 4·5′. This lateral gave rise to four secondary branches on its right side at approximate distances of 0·7′, 1·5′, 1·9′ and 2·4′ respectively in descending order.

The tap root again went vertically down to a depth of 1′ when it gave rise to four lateral branches. Thus, five lateral branches arose from the tap root within 1·5′ from the surface

Plate No. I. Shewing the root development under ½″ irrigation.

soil. The laterals, however, gave rise to other secondary and tertiary branches. The tap root, however, penetrated to a depth of 6·8′ (Plate No. I).

*B. Root development under 3″ irrigation.*—Under 3″ irrigation great number of roots were found at the base of the stem. Many of them were only 1″ to 4″ in length, and highly branched. The branching was also profuse in the upper 6″. Sometimes the ultimate branchlets were 0·3″ to 1″ in length. The tap root entered the soil horizontally but immediately persued a downward vertical course and penetrated upto 4·3′ depth and gave rise to two laterals, of length 3·8′ and 5·1′ respectively. The lateral measuring 5·1′ gave rise to two sub-laterals originating at the depth of 0·2′ and 2·5′ on its right and left respectively. The sub-lateral originating on the right side again gave rise to further branching, the deepest penetration being 3·1′ from the place of its origin. The deepest depth from the surface of the soil was 4·0′. The sub-lateral from the left side at the depth 2.5′ had its maximum vertical penetration of about 1·2′.

The other lateral measuring 3·8′ gave rise to several other sub-laterals, the deepest depth of one of these was 2·7′ (Plate II).

Plate II. Showing the root development under 3″ irrigation.

The root development under 1″ and 2″ irrigations were more or less similar. The tap root under 1″ irrigation was 5·6′ with four major laterals while in case of 2″ irrigation the tap root measured 5·4′ with same number of laterals.

*C. Dry weight of roots.*—The roots were thoroughly washed and dried in an oven to constant weight at a temperature of 65° to 70° C. (at the higher temperature charring of the finer roots took place).

TABLE I

*Showing the relative dry weight of roots (average of four plants of each treatment)*

| Treatments | Average total dry weight | Percentage difference |
|---|---|---|
| A. ½″ irrigation | 21·220 gm. | 119·12 |
| B. 3″ irrigation | 9·684 gm. | |

Thus it is evident that there is considerable difference not only in the depth of penetration of the tap and secondary roots under light and heavy irrigations but also in the dry weight, the percentage difference being 119·12.

*II. Yield in relation to root system.*—Table II gives the records of yields under different depths of irrigations and corresponding root development.

TABLE II

*Showing the relation between yield and root development*

| Treatments | Average depth of tap root | Average number of laterals | Average total dry weight | Mean yield per plot (18′×34′) | Probable error |
|---|---|---|---|---|---|
| | | | gm. | srs. | |
| ½″ irrigation | 6·8′ | 5 | 21·220 | 238 | S.E. of difference =11·02 srs. |
| 3″ irrigation | 4·1′ | 2 | 9·684 | 193 | Critical diff. at P=·05=24·885 srs. |

The average yield was significantly greater under ½″ irrigation when the root system was deeper and more penetrating than in the other.

The inference is:—(i) under excessive irrigation, the top development of tomato roots is considerably greater, but the branches are short, and end abruptly. They are, however, abundant and more profuse in the first foot of soil. Only a few major branches descend vertically to supplement the absorbing area of the tap root.

(ii) Under light irrigation, the root system is not so widely spread in the upper region, but penetrates much deeper, upto 7·2′, and the roots are comparatively thicker. Thus, the vertically penetrating roots enter the deeper

layers of the soils, and probably contribute to the increase in yield.

Govt. Agri. College, Kanpur, *April* 12, 1950.

S. N. SINGH.
B. S. JOON.

1. Boynton, D., "Soil moisture and fruit growth in an orchard situated in the Hudson Valley, N.Y.," *Proc. Amer. Soc. Hort. Sci.*, 1936, **34**, 169–72. 2. Magness, J. R., Degman, E. S., and Furr, J. R., "Soil moisture and irrigation investigations in Eastern Apple Orchards," *US. Dept. Agr. Tech. Bull.*, 1935, No. 491.

## EFFECT OF SHORTENING THE DAILY LIGHT PERIOD IN THE MORNING AND IN THE EVENING, IN SHORT-DAY TREATMENT OF JUTE

IT has been found previously[1,2] that both the species of jute *C. capsularis* L. (D 154) and *C. olitorius* L (C.G.) behave as short-day plants.

In an experiment with the two species to compare the effect of shortening the daily light period in the morning hours following sunrise and in the evening hours before sunset in the 8 hours and 10 hours light period treatments, one set of plants was darkened in the morning commencing at sunrise and the other set in the evening ending at sunset, the periods of darkening in the ventilated dark room in both the cases being adjusted to provide for the required periods of light. The plants were sown on 17-4-1948. in earthenware pots of 13″ diameter and 13″ height, and there were 12 plants per treatment grown in 3 pots with 4 plants each. The flowering time taken as the date of initiation of first visible flower-bud and the fruiting time as the date of initiation of first visible fruit and the heights in cm. at flowering were noted separately for each plant and recorded as mean of 12 plants in Table I for *C. capsularis* and Table II for *C. olitorius*.

It will be seen that plants darkened in the morning in the 8 hours treatment flowered much later than those darkened in the evening, the difference in the case of 10 hours being not so prominent. The heights at flowering are however not very different in the two types of treatment under each light period. All the plants produced flowers and fruits, but only 41·67% of the plants that flowered under 8 hours treatments darkened in the morning produced fruits. In general the plants exposed to darkness during morning hours gave a sickly appearance as the leaves were not properly developed near the apex. Many of them became deformed by curling and were shed in large number. This was more clearly visible in the 8 hours treatment.

TABLE I. *C. capsularis*

Flowering and fruiting times and heights at flowering of plants darkened in the morning following sunrise and darkened in the evening before sunset.

| | | Height in cm. | | Flowering time | | Fruiting time days |
|---|---|---|---|---|---|---|
| | | Mean | S.E. | Mean | S.E. | |
| 8 hrs. | Dark in the morning | 47·87 | ±2·04 | 55·59 | ±1·67 | 66·2<br>41·6% |
| | Dark in the evening | 46·96 | ±5·75 | 37·17 | ± ·344 | 50·4 |
| 10 hrs. | Dark in the morning | 46·16 | ±1·53 | 35·09 | ± ·336 | 46·9 |
| | Dark in the evening | 49·78 | ±2·19 | 33·59 | ± ·484 | 44·6 |
| Normal (control) | | 182·23 | ±4·75 | 130·92 | ± ·763 | 150·6 |

TABLE II. *C. olitorius*

Flowering and fruiting times and heights at flowering of plants darkened in the morning following sunrise and darkened in the evening before sunset.

| | | Height in cm. | | Flowering time | | Fruiting time |
|---|---|---|---|---|---|---|
| | | Mean | S.E. | Mean | S.E. | Days |
| 8 hrs. | Dark in the morning | 45·30 | ± 6·21 | 54·62<br>66·6% | ±4·23 | 44.0*<br>8·3% |
| | Dark in the evening | 5·59 | ± ·251 | 24·59 | ± ·149 | 35·7 |
| 10 hrs. | Dark in the morning | 47·05 | ±10·37 | 44·5 | ±4·83 | 63·2 |
| | Dark in the evening | 11·02 | ± ·391 | 21·0 | ± ·213 | 30·2 |
| Normal (Control) | | 242·56 | ± 7·46 | 125·7 | ± ·891 | 144·7 |

* One plant of this treatment flowered much earlier than others in 25 days and this plant produced a small number of fruits. The others which flowered later did not produce any fruits, hence the fruiting time recorded for one plant here is earlier than the recorded mean flowering time.

In *C. olitorius* the plants darkened in the morning were very much affected and the leaves were not properly formed, and many of them near the apex were curled. Their leaves did not develop the normal green colour and a large number of them were shed. In this species the flowering time of the plants darkened in the morning both in 8 hours and 10 hours treatments is much longer than those darkened in the evening, the heights at flowering of the set darkened in the evening are comparatively much shorter than those darkened in the morning, and the differences are much more prominent than in *C. capsularis*. The plants treated for 8 hours and 10 hours periods and darkened in the morning required a longer period to produce fruits than those darkened in the evening in this species. Plants under 8 hours treatment darkened in the morning failed to produce fruits except in one plant out of 12.

The delay in flowering as also the diseased condition in the sets which are darkened in the morning compared with those darkened in the evening show that when the darkening is done in the morning hours, the normal harmonious nutrition and growth balance of the plants is disturbed, and also that the production of the flowering hormone is retarded, more clearly in the case of 8 hours treatment and in *C. olitorius*.

Botanical Laboratory, Presidency College, Calcutta 7, *April* 28, 1950.

J. C. Sen Gupta.
Gita Sen.

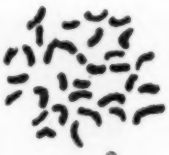
1. Sen Gupta, J. C., and Sen, N. K., *Journ. Ind. Agric. Sci.*, 1946, **14**, 196–202. 2. —, *Nature*, 1946, **157**, 655–56.

## CHROMOSOME DIMINUTION IN A PLANT ROOT

In the course of paddy breeding, a hybrid between *Oryza sativa* ($2n = 24$) and *Oryza eichingeri* ($2N = 48$) was produced at the Paddy Breeding Station, Coimbatore. This hybrid is completely sterile and has been maintained over a course of years by vegetative propagation. Counts of chromosome numbers in the root tips of this plant, gave the expected number 36. However, chromosome numbers fewer than this were also counted in intact cells. Therefore more sections were prepared and counts made from undisturbed metaphase plates. The counts made showed that in some cells the number is diminished. In every fresh planting of this hybrid stubble, the root initials do start with 36 chromosomes, but in the older portions of the root, the number falls to 34, 33, or 32 chromosomes. Figs. 1 and 2 are camera lucida drawings from two cells, and they show the type of preparations from which the observations were made. The diminution is at random, and has been observed in cells of the plerome, and not in those of the dermatogen. The mitotic mechanism by which such diminution occurs could not be determined.

In order to find out if this feature was controlled by the environment, the hybrid stubble was rooted in washed monazite sand from Travancore, having a thoria content of 9%. The root growth was vigorous in this sand. In the sections, details of mitosis showed slight differences from those in soil grown roots. In the monazite grown roots, the chromosomes were less contracted and counting them was more difficult. However chromosome diminution was noticed in this culture also. Exact comparisons could not be made owing to the crowding together of the small chromosomes in metaphase plates.

1



2

Study of literature showed that there are other records of similar exceptions to the general principle, that all the cells of an organism possess the identical chromosome complement. Huskins[1] has shown that the principle cited is an over-simplification and has also drawn attention to proved exceptions. He has also shown that chromosome diminution can be brought about artificially, and that 2% solution of sodium nucleate can cause reduction of chromosomes in growing roots. Muntzing[2] has also recorded that 'B' chromosomes are largely eliminated in the somatic tissues of a *Sorghum*, and that this elimination is detectable even in the embryo. In *Pennisetum polystachyon* (Dry Napier grass or Thin Napier grass) I have observed a marked chromosome diminution to occur in secondary roots. In this natural polyploid the somatic number is 54, and counts as low as 34 have been made by me.

An explanation of this diminution cannot be advanced until more data is available. This

observation is recorded to show that there is an unexpected source of error in determining chromosome numbers of polyploids from root tips.

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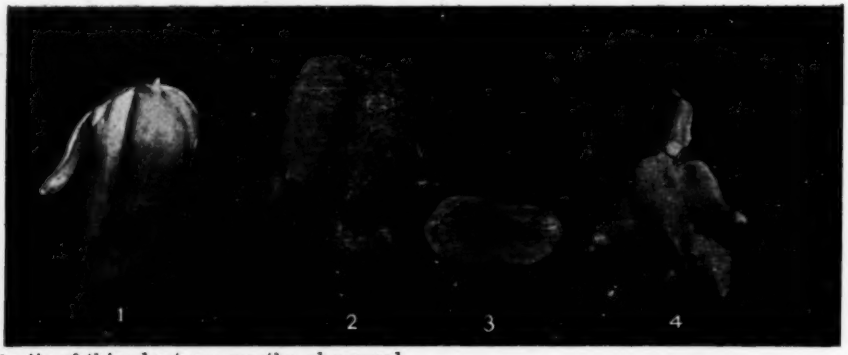
*May* 12, 1950.

1. Huskins, C. L., *Heriditas, Lund.*, 1949. *Suppl.* **35**, 274–85. 2. Muntzing, A., *Ibid*, 408–09.

## HALF-APOCARPY IN *CARICA PAPAYA* LINN.

THE fruit in *Carica papaya* Linn. is developed from a syncarpous ovary of five carpels with parietal placentation. Normally, the style is single, but very short carrying five laciniated stigmatic lobes. Apocarpous fruits have been noticed on a plant at the Botanic Garden at Coimbatore. In papaw, the internal proliferation has been recorded by Bergman (1921), Sayeeduddin and Bari (1936) and Khan (1946), and viviparous germination is a common feature; but the apocarpous nature, we believe, is being recorded here for the first time.




The fruits of this plant are mostly abnormal with varying numbers of " finger "-like projections (Fig. 1 to 4). A few normal fruits are also formed. Fig. 3 shows the section of a fruit which looked like two fruits having fused together for outward appearance; but the section revealed five placentas distributed in the two locules. The bigger chamber has three placentas showing that it is of three carpels and the smaller with two placentas. Some of the fruits had five distinct fingers (Figs. 2 & 4) and each finger is a carpel with a small locule.

Closer examination of the flowers and developing young fruits showed that the pistil had initiations for the apocarpous condition in the early stages itself. Each 'finger' carried an independent stigmatic lobe; this and the distribution of the placentas in the locules prove that the carpels are apocarpous and not syncarpous with a single locule. Since the carpels are fused at the base and free towards the ends, it is described here as '*half-apocarpous*'. Similar instances have been recorded by Wordsdell (1916) in orange and lemon where the dissociation of the carpels ('quarters') gave rise to curious fingered fruits with the carpels united at the base.

It is generally recognized that the most primitive type of pistil is the apocarpous one. The present instance of dialysis of the carpels resulting in half-apocarpy is probably a case of reversion. As the plant produces fruits which are mostly of the type described above, it will be of interest to see whether this character is repeated in the progenies.

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Coimbatore,
*November* 30, 1949.

1. Bergman, H. F., *Bot. Gaz.*, 1921, **72**, 97–101. 2. Khan, A. S., *Sci. and Cult.*, 1946, **12**, 194. 3. Sayeeduddin, M., and Bari, A., *Curr. Sci.*, 1936, **4**, 740–41. 4. Wordsdell, W. C., *The Principles of Plant Teratology*, Ray Society, London, 1916.

## INTEGUMENTARY VASCULAR TISSUE IN *CASSIA TORA* LINN.

IN the majority of angiosperms, the vascular strand of the funiculus enters the ovule and ends in the region of the chalaza. Instances are, however, known where it extends beyond the chalaza, entering the integument and extending as far as the region of the micropyle. Such integumentary bundles have been report-

ed in a number of dicotyledonous families and are almost always restricted to the outer integument. Netolitzky[1] has cited among others, a few members of the Papilionaceæ as showing this condition. During an embryological study of *Cassia Tora* (N.O. Cæsalpiniaceæ), the author found very prominently developed vascular strands in the outer integument of the developing seed. At the time of fertilisation the vascular strand that supplies the ovule stops short at the chalaza but with further development strands of elongated cells appear in the outer integument and they organise themselves into distinct vascular elements (Figs. 1, 2). They are, however, not associated

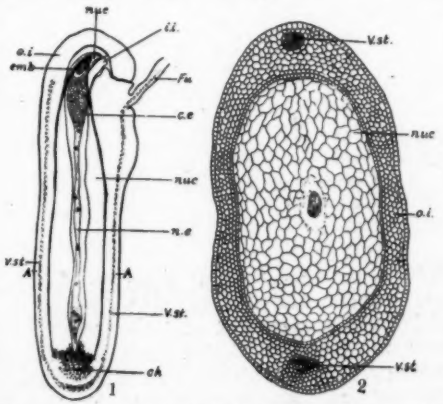


FIG. 1. L. S. of developing seed showing vascular strand in outer integument. ×18.

FIG 2. Cross-section taken at level AA indicated in Fig. 1 showing vascular supply of developing seed. ×67. (*fu.*, funiculus; *o.i.*, outer integument; *i.e.*, inner integument; *nuc.*, nucellus; *emb.*, embryo; *c.e.*, cellular zone of endosperm; *n.e.*, free nuclear zone of endosperm; *v.st.*, vascular strand; *ch.*, chalaza).

with any specialised structures like sclerenchyma fibres, pigmented cells or oxalate crystals as is often the case in the instances mentioned by Netolitzky.[1] The appearance of such vascular strands in the outer integument during the post-fertilisation stages is perhaps partly due to the increased demand for a conducting system on account of the enormous increase in size of the ovule.

Preliminary observations indicate the occurrence of similar integumentary vascular bundles in other species of *Cassia* and in *Parkinsonia aculeata*, also a member of the Cæsalpiniaceæ. A fuller account of the embryology of these species is being published elsewhere.

Grateful thanks are due to Prof. P. Maheshwari of the Delhi University for valuable suggestions.

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*April* 20, 1950.

1. Netolitzky, F., *Anatomie der Angiospermen-Samen*, 1926, Berlin.

## CHLOROZOL FAST PINK, B.K.S., AS AN ANTICOAGULANT IN EXPERIMENTAL PHYSIOLOGY

IN searching for a suitable alternate anticoagulant for Starling's Heart Lung preparation, choice fell upon chlorazol fast pink B.K.S., No. 353 in the colour index. Jorpes[1] mentions many points in favour of this dye which, according to him, is in some ways better than Heparin. Kahlson and Landby[2] have made a detailed study of its use in Experimental Physiology. However, the exact effective dose could not be ascertained from available literature, and had to be determined by trial.

To 0·5 c.c. of different dilutions of the dye was added 4·5 c.c. of blood from the carotid artery of a dog under paraldehyde anæsthesia, mixed quickly, and the coagulation time noted. It was found that a concentration of 1·7 mg. of the dye per c.c. of blood prevented coagulation *in vitro* for over 6 hours. Taking the amount of blood in the dog as 8% of the body weight, this worked up to 0·13 gm. per kg. body weight. To allow for a slight diffusion into the tissue fluids, and to have a margin of safety for experiments involving surgical operations, it was decided to use 0·2 gm. per kg. body weight. Two dogs under paraldehyde anæsthesia were injected intravenously with 4% solution of the dye in normal saline solution calculated at the above dosage. Blood was removed from one of them and used to fill the apparatus, while the other was used as the experimental animal. The dye was found to be non-toxic and effective at the above dosage besides being also cheaper than Heparin and easily procurable. With it, the Heart-lung preparation works very well.

Dept. of Physiology, K. N. GOVINDAN NAYAR.
Madras Veterinary College,
*May* 5, 1950.

1. Jorpes, J. E., "Heparin," Its Chemistry, Physiology and Application in Medicine, Oxford. 2. Kahlson and Landby, quoted by Jorpes.

# REVIEWS

**New Directions in Science Teaching.** By Anita D. Laton and S. Ralph Powers. (McGraw-Hill Book Company, New York), 1949. Pp. 164. Price $ 2·50.

One of the main defects in the present-day educational system is that it is too academic and uncorrelated to the environment and the needs of the community. The teaching in Schools and Colleges is largely stereotyped and based on set-syllabuses for a cluster of subjects, with neither elasticity in subject-syllabuses nor any co-ordination between syllabuses of different subjects. Educational reforms based on committees and questionnaires usually take the form of a regrouping of subjects or recasting of syllabuses or both. Such a reshuffling of courses often results in leaving out the essential reform, namely correlating the education of the young to the changing times and growing needs of the community.

A new method of approach based on investigation and researches in the teaching of sciences at the secondary school level was made by the Bureau of Educational Research in Sciences in U.S.A. since 1935, with the active co-operation of seventeen selected schools in the States. The work of the Bureau may be divided into three major intervals: (1) Period of Exploration, 1935-38, (2) Preparation for Teaching Suggestions, 1938-40 and (3) Application to class-room practice, 1940-43. During the first interval specialists in several fields of learning —Biology, Chemistry, Physics, Philosophy— worked together to determine the aim of scientific education in relation to the life of the people. The goal of the second interval was to develop methods of teaching by which the aim so determined is achieved. Expert teachers worked in the Bureau and prepared ' Suggestions for Teaching'. In the third interval effort was made to translate the work of the two phases into actual class-room practice. The book under review describes the work done in the third interval.

Seventeen Schools co-operated in the project. The representative teachers from the Co-operating Schools worked together in Summer Workshops during 1940-43, to extend their own education in areas in which they work and also to prepare teaching materials suitable to the maturity levels of their classes. The planning was based on the assumption that the ' function of the school is to present opportunities for young people to achieve a *useful* education, that is an education recognised by the students as suitable to their needs. The Summer Workshops were characterised by general meetings, special lectures, group conferences and field trips. In these courses and in their schools through the year, teachers made individual study of the resources and the people of the community in which they are teaching and in which their students are likely to live; study of the young people —their needs, their characteristics, their vocational interests, their standards of conduct and family relationships; and study of the current problems affecting the nation and the individual such as intercultural relations, personal health, uses of material and energy, economic trends, etc. All the co-operating teachers gained new perspectives and new knowledge in the teaching of the young. With these experiences they were able to develop new courses of study in biology, physical sciences and experimental chemistry and plan interdepartmental courses such as an integrated course of science and social studies, of Science and English, of American history and chemistry, of chemistry and economics, of biology and home nursing, etc. Their study also resulted in new emphases within existing courses—such as the emphasis on human development and growth in biology classes; on the study, utilisation and conservation of natural resources in the science courses; and on the place of man in the Universe in the Astronomy classes. The book under review gives a descriptive report on the changes in the curriculum and in the method of teaching of science in schools and also an estimate of the changes in the young people and in the teachers who participated in the working of the scheme. A perusal of the book will no doubt be stimulating to those who are concerned with the teaching of the younger generation, and the reorganisation of education in the country.

C. S. V.

**Progress in the Theory of the Physical Properties of Glass.** By J. M. Stevels. (Published by Elsevier Publishing Company), 1948. Pp. xi +104. Price 10 *sh.* net.

This is one of the monographs on the progress of research in Holland during the war. Due to

the exigencies of war D. J. M. Stevels, who is an authority in glass technology, was forced to divert his attention from experimental to the theoretical study of the properties of glass. This book records the results of his investigation and represents a considerable advance in the knowledge of the structure of glass.

The first chapter is in the nature of a general introduction where the concepts of Zachariasen and Warren on the structure of glass have been elucidated. The four chapters that follow are entitled: Density of Glass, the Electrical Conductivity of Glass, the Dielectric losses of Glass and the Molecular Refraction of Glass. In each chapter the author describes the various physical methods for the investigation of the structure of different glasses. The studies of the constitution of these glasses are based on fundamental physical concepts and the application of these leads to the classification of glasses as *normal* and *abnormal*. The author accounts for the abnormalities by postulating structural differences.

The volume will be found very stimulating not only to those who are actively engaged in the investigation of the structure of glass but also to those interested in the larger domain of the physics of the solid state of matter.

S. RAMASESHAN.

**Experimental Physical Chemistry.** By Farrington Daniels, J. H. Mathews, J. W. Williams, P. Bender, G. W. Murphy and R. A. Alberty. International Chemical Series. (McGraw Hill Book Company, New York), New fourth Edition, 1949. Pp. xiii+568. Price $ 4·50.

The first edition of this well-known book appeared in the names of the three senior authors in 1929. In the preparation of each of the subsequent new editions "there have been two major objectives: to keep pace with the new developments in physical chemistry, and to keep the book always representative of the teaching of the laboratory course in the subject at the University of Wisconsin". This has been facilitated by the more recent collaboration of three younger members of the professoriat, who are " somewhat closer to the problems of the laboratory instruction ". The advantages of this kind of collaboration need scarcely be stressed, and such co-ordination has become a very pleasing feature of some of the recent American publications.

Part I of this book with 15 chapters deals with a variety of experiments under 64 different topics, which besides routine exercises include those on dielectric constant and dipole moment, photochemistry, Raman effect, chromatography, and radioactive tracer technique. Part II with 11 chapters deals with apparatus and methods with a discussion of errors of measurement.

As far as the exercises are concerned, the claim to keep pace with the new developments in physical chemistry has been fully justified, and no important topic has been left out. The title however may be a little misleading. " Experimental Physical Chemistry" should not be taken as equivalent to " Practical Physical Chemistry". In the Preface to the first edition the authors remark: " The imperative is not used. Procedures are described but orders are not given. The student must study the experiment first and then set his own pace...." In other words there is no "spoon-feeding", for which reason this is not a beginner's book. A student who attempts to carry out physical chemistry experiments for the first time with the aid of this book alone without assistance from an instructor can scarcely hope to make much progress in a reasonable time. To give an illustration, it is very doubtful if a student can carry out successfully with the directions given on pages 174-75 a determination of " Transference Number". It has been the experience of several teachers that in such cases a worked-out example with all the relevant observations is the best method of initiating the student in the experiment. Of course the instructor can help. But in a class with a large number of students engaged in different kinds of exercises this will be a great strain on him.

On the other hand, in this book wherever more experimental details are required complete references are given. In the case of " Transference Number" mentioned above besides the Hittorf method, the moving boundary method is also described with the essentials of the theory and experiment, and more important still, with the latest references. This applies to all exercises dealt with. The book is an excellent one and can be recommended to all teachers and advanced and research students who wish to have a ready reference book for routine experiments as well as the latest techniques in physical chemistry. M. R. N.

**Vacuum Tube Amplifiers.** Edited by George E. Valley and Henry Wallman. (Vol. 18 of Radiation Laboratory Series; McGraw Hill Book Co. Inc., N.Y.), 1948. Pp. 743. Price $ 10·00.

The volume under review is devoted to a detailed consideration of the several problems

that call for attention and solution in the design and application of vacuum tube amplifiers for the different functions to which they have been put to in recent years. The amplifiers discussed in this volume are instances of extreme performance value with reference to one of the several characteristics namely, bandwidth, sensitivity, linearity, constancy of gain over long period, etc.

The first chapter is devoted to "Linear Circuit Analysis and Transient Response". This includes the mathematical analysis of the theory of the Laplace Transform and its application in the solution of network problems. Towards the end of the chapter there is a section, summarising the use of L-Transform in network problems. This will be highly appreciated by readers who are more keen on utilising the Laplace Transform as a tool in solving practical network problems than in following the analysis of Laplace Transform theory itself. This chapter also includes examples of the use of L-Transform theory to solve practical network problems.

Chapter 2 is devoted to the analysis of amplifiers of direct pulse, where the emphasis is on their high fidelity characteristic as contrasted with large dynamic range pulse amplifiers discussed in the following chapter. The investigation of the rectangular pulse is considered in two distinct parts, namely, the reproduction of the leading and the trailing edges and the reproduction of the flat top. Special two-terminal and four-terminal circuits are discussed which possess the characteristic of low rise-time and over-shoot which are essential requirements from the point of view of faithful reproduction of the leading edge of the pulses. Similarly, the effects of the different parts of the circuit on the flat-top response are considered together with the schemes for compensating for the sag that would otherwise occur. This chapter also includes sections on inverse feed-back, gain-control, and mixing of multiple input signals in such pulse amplifiers. Further, there are also sections devoted to limiting amplifiers, electronic switching of pulse amplifiers and the output stage of such amplifiers. Lastly, this chapter also includes two examples of pulse amplifiers, one of which is designed for deflection-modulated cathode-ray tube and the other for intensity-modulated cathode-ray tube.

Pulse amplifiers of large dynamic range are discussed in an equally detailed style in Chapter 3.

Wide-band, high-frequency band-pass amplifiers are discussed in Chapters 4 to 8; the last of these chapters is devoted to "Amplifier Measurement and Testing" including a section on undesired regeneration effects in Band-Pass amplifiers.

Chapter 9 discusses low-frequency amplifiers with stabilised gain, which is the chief characteristic required by computer amplifiers. The gain of such an amplifier must be held constant within closely prescribed limits regardless of the variability of vacuum-tube parameters, the manufacturing tolerances of passive components, etc. Inverse feedback circuits that can be employed to achieve the desired constancy of gain with respect to circuit parameters are analysed. Illustrations of the design of computer amplifiers are also included.

Chapter 10 is devoted to the consideration of frequency-selective amplifiers of low-frequency range.

Direct-coupled amplifiers which have several fields of application such as vacuum tube voltmeter, cathode-ray oscillograph, D. C. Servoamplifiers, etc., etc., are discussed in great detail in Chapter 11, treating all problems peculiar to such amplifiers.

Chapter 12, 13 and 14 deal exhaustively with the subject of noise. The first of these chapters develops the subject in a rigorous theoretical manner. The next chapter discusses the points to be borne in mind while designing amplifiers for best signal to noise ratio. The last chapter explains the experimental measurement of noise figure in amplifiers, which also is an estimate of amplifier sensitivity.

Each of the above chapters is written by one or more authors, who, in the course of their work, have had occasion to study deeply the particular branch to which the chapter pertains to. Consequently the entire volume is masterly in the presentation of both theoretical and practical aspects of varied types of vacuum-tube amplifiers included in this volume.

This book will serve as a very useful guide to research workers and Electronics Engineers who may be working on special type of amplifiers as distinct from the common audio and R. F. amplifiers. B. N. PRAKASH.

**Allergy.** By Arthur F. Coca and eight other authors. *The Annals of the New York Academy of Sciences.* Vol. 50, Art. 7. (New York: Published by the Academy), December 26, 1949. Pp. 679-814. Price $ 2·50.

The publication is a collection of papers on the controversial subject of allergy, presented

by workers who are actively engaged in this field of investigation. The monograph covers various aspects of the subject, viz., atophy, contact dematitis, serum allergy, drug allergy, hypersensitiveness of infection, familial nonreaginic allergy, etc.

In the introductory paper on experimental anaphylaxis in lower animals, Seegal presents some means of experimental sensitization which may also operate in human allergies. The varieties of the mainfestation of experimental anaphylaxis have been described with the purpose of bringing out similiarities between these diseases and the natural allergic disease of man.

This is followed by several papers discussing the various aspects of the allergic diseases, experiments and demonstrations in these diseases and modes of alleviation and cure. These reveal much valuable informations on the different manifestations of allergy, its relation to immunity and the familial nonreaginic allergy. Discussing the allergy of infection Seegal concludes that with the newer methods of immunochemistry, the problems of allergies of infection and their relation to immunity will be clarified. Familial nonreaginic food allergy or "idioblapsis" owes its name to Dr. Arther F. Coca. Meyer has examined this highly controversial subject critically and has presented a paper in an attempt to explain the rationale of the conclusion that there is an extraneous factor which not only precipitates a disordered mechanism of bodily function but also renders the organism susceptible to the ravages of certain infection agents. The paper is divided into three sections (1) theory, (2) practical application, (3) results obtained. By this presentation, the author hopes to prove the existence of idioblapsis as an entity.

Coca in his paper on "the anti-allergic action of sympathectomy" gives a brief critical review of the literature concerning sympathectomy and sympathetic procaine-block. According to the results of his study of the antiallergic effect of sympathectomy, the author emphasises that the operation should no longer be considered as a therapeutic measure for the relief of particular symptoms but almost always a means of lesening the extent and severity of the food allergy that causes them and so facilitating its complete dietary control.

The publication is a valuable addition to the literature on allergy.

N. N. De.

**Advances in Carbohydrate Chemistry, Vol. 3.** Edited by W. W. Pigman and M. L. Wolfrom. (Academic Press, Inc., New York), 1948. Pp. xxili + 424. Price $ 8·50.

The third volume of this excellent series on the compilation and critical presentation of various themes in carbohydrate chemistry was published in 1948 and should by now be familiar to every teacher and research worker in this field. The present treatise maintains the high standard of its predecessors. There are eleven essays providing authoritative and carefully integrated information on a wide range of topics. These include: Conventions used for writing stereo-formulæ in a plane (C. S. Hudson); Reactivity of the hydrazone and osazone derivatives of sugars (E. G. V. Percival); Configuration of the cyclitols (H. G. Fletcher, Jr.); Trityl ethers of carbohydrates (B. Helferich); Unfermentable reducing substances in cane molasses (L. Sattler); and, Halogen oxidation of simple sugars (J. W. Green). The book also contains timely and instructive chapters on: The molecular constitution of cellulose (J. Compton); Use of isotopes as tracers in the study of carbohydrate metabolism (S. Gurin); Enzymic degradation of starch and glycogen (K. Myrbäck); Polysaccharides of Mycobacterium tuberculosis (M. Stacey and P. W. Kent); and, Chemistry of streptomycin (R. U. Lemieux and M. L. Wolfrom).

Publications, such as this series of 'Advances', representing well collated surveys of recent literature and stimulating articles of great general interest, by recognised authorities on the different specialised branches of the subject, are bound to serve as invaluable aids to student, teacher, and investigator alike.

A. Sreenivasan.

**Practical Invertebrate Anatomy.** By W. S. Bullough (Macmillan & Co., Ltd., London), 1950. Pp. 463. Price 28 *sh.* net.

In this book the author has briefly described the structure of 122 invertebrate animals commonly examined or dissected by students working for their Pass and Honours degrees in Zoology. The book is divided into twenty chapters; each chapter deals with examples of one phylum, although the large phylum Arthropoda rightly occupies five chapters. The descriptions are prefaced by a short account of the characteristics of the phylum and class as well as of the distribution, habitat and mode of life of the genus, and are accurate and of

reasonable length, although a few details are not strictly correct. On page 183, for example, it is stated that "each nephridium (of *Hirudo*) has a nephrostome opening into a cœlomic pouch, which in those segments possessing testes is also the testis pouch." It has been definitely proved (*Q.J.M.S.*, 1938) that the initial lobe of the nephridium of *Hirudo* (as of *Hirudinaria*) is always blind and there is no such structure as a nephrostome, forming the inner end of the nephridium comparable with the nephrostome of an earthworm nephridium. What is present is a "ciliated organ" enclosed separately from the nephridium proper within a cœlomic space in one of the walls of the testis-pouch and not communicating with the lumen of the testis-pouch itself. Further, in the non-testicular segments, there is not even a separately enclosed "ciliated organ", nor is there a cœlomic pouch in connection with the nephridium. But these minor inaccuracies, which will undoubtedly be corrected in a subsequent edition, do not detract from the value of the book over which the author has taken great pains. The book is profusely illustrated with original diagrams drawn from dissections. We commend the book for use in Indian Zoological Laboratories, where it will prove very instructive and helpful.

K. N. B.

**Equilibrium Data for Tin Alloys.** (Tin Research Institute, Middlesex, England), 1949. Price 2 *sh.* 6 *d.* net.

The equilibrium diagrams of binary alloys of various metals with Tin are collected together and presented in an attractive and intelligible fashion in this publication, which also contains a bibliography of ternary diagrams of important alloys of tin.

The diagrams, based upon latest research, are accompanied by adequate explanatory notes on crystal structures and composition limits of various microstructural phases, solid phase transformations, etc. The diagrams of greatest importance are undoubtedly those of Sn-Cu, Sn-Sb, Sn-As and Sn-Ag which are here well supported by general data.

The printing and general get-up of the publication leave little to be desired. While an additional page giving data about tin itself would have been of considerable general interest and value, the publication is a valuable addition to the research metallurgist's library.

E. G. R.

**Preface to Library Science.** By S. R. Ranganathan. (University of Delhi, Delhi), 1948. Pp. 203. Price Rs. 9.

This book provides a background instruction to students of the library course in the University of Delhi, and is in part addressed to all those who are interested in libraries. No details of the routine library work are to be found in this book, these being left to the regular course work. A good part of the book explains in detail the five laws of library science which were published by the author first in 1931. It is stated that these laws are as simple and "trivial" as the fundamental laws of any other branch of science, and a plea has been put forth for the recognition of the technique involved in library work as a separate science by itself. It is further urged that instruction to students of library science should be imparted at the University level, with short-term and long-term courses ending in certificates and diplomas and graduate and post-graduate degrees.

That there is a technique in librarianship cannot be denied at all, but whether it is of the professional type or of scientific standing needs careful consideration. Librarians, who know the depth and breadth of the technique, will hardly disagree with the author, but it is the uninitiated who are likely to be unappreciative of the claim. One might argue that if systematic botany or zoology is a branch of science, library classification around which library routines have been developed is as scientific in its foundation or structure. The whole question is, however, such as can be authoritatively solved by the world of science.

The third part of the book deals with the author's plea for a library grid for the country, of which a first outline was published in the form of a pamphlet in the "Library in India Series" in 1944. The treatment of this part is rather cursory, but it gives the reader an idea of the magnitude and urgency of the problem. The book, though apparently rather highly priced, is worth reading by all who want to have an overall general picture of the library problem in India.

G. T. KALE.

**Ionisation Chambers and Counters.** By Bruno Rossi and H. Staub. National Nuclear Energy Series, V-2. (McGraw Hill Book Co., New York), 1949. Pp. 243. Price $ 2·25.

The spectacular landmarks in the progress of physics in recent years have been usually connected with the development of new experimental techniques of detection and

measurement. The practical realisation of Atomic Energy and the bomb has resulted amongst other things from tremendous advances in nuclear experimental technique and from the importation into physical experimentation of tricks discovered in electronics and radar. Research workers would therefore welcome the publication of the National Nuclear Energy Series embodying reports of experimental work carried out under the U.S.A. Atomic Energy Project, even though these reports cover only declassified work and contain much that is commonly known amongst advanced schools of nuclear physics in Europe and America. The present book is the second volume describing the experimental techniques of the Los Alamos Laboratory and relates particularly to ionisation chambers and counters.

The opening chapter presents without attempting to derive many of the formulæ, the main facts of the behaviour of free electrons and ions in gases which form the basis of the operation of detectors of nuclear particles. Indeed, to a reader who is not familiar with this branch of physics, it would be impossible to appreciate the significance of many cunning devices which are described in detail in the later chapters. While ionisation chambers measuring approximately constant sources of ionisation have been in use for a long time, the main advance in recent years is in the design of fast chambers which, with special associated circuits, reproduce faithfully the shape and size of the original ionisation pulse. The design and construction, the calibration and the theory for interpretation of results of various types of chambers and proportional counters for not only the heavy nuclear particles, but also Beta, Gamma and X-rays are described with a wealth of practical detail which will be most valuable to research workers in this field. The chapters on neutron and fission detectors are particularly interesting for the ingenuity of design of apparatus. This applies especially to the flat response neutron counter, and to the spiral fission chamber which is described in some detail and which combines very high counting yield with extremely small dimensions. The appendix at the end contains a number of useful results and formulæ for the experimenter.

The subject of geiger counters is not dealt with in great detail, but this is not a serious deficiency as there are already good books dealing with this subject exhaustively. Of interest in this book to any experimenter would be the account of the hot calcium purifier (page 108) for the gas fillings used in chambers, and the technique of drilling in glass plates holes as small as 3 mils in diameter and fusing platinum wire in them (page 199).

The usefulness of this book would be very much increased if it had a complete bibliography. But the authors have in the Preface excused themselves for this omission due to the special circumstances under which the original laboratory reports were compiled and prepared for publication. As it stands, the book will be useful or indeed fully comprehensible only to research workers specialised in experimental nuclear physics. The small band of such workers in this country will certainly profit enormously by acquiring from this book the 'know how' which is otherwise so difficult to obtain.

VIKRAM SARABHAI.

## THE GOVT. BOTANIC GARDENS, OOTACAMUND

THE Ooty Botanic Gardens, whose centenary was recently celebrated, owe their inception to the organising genius of Mr. McIvor of the Royal Botanic Gardens at Kew and have, as was emphasised during the celebrations, attained to the position of a national asset both from the points of view of æsthetic education and scientific progress. They have indeed led the way in the development of the cinchona industry, introduction of the potato crop, cultivation of English vegetables and study and nurture of medicinal plants like the eucalyptus.

Botanists and Horticulturists who have visited it will know that it houses plants representing over a hundred families and drawn from more than thirty countries of the world. Of roses alone, there are nearly 80 species, while of the eucalyptus, there are nearly 35 varieties. Equipped on thoroughly modern lines as an experimental research station, the Gardens have been doing useful work on hybridisation and cultivation of ornamental and economic plants.

With more intelligent support from the Government and the people, there is no reason why the century which it has just begun should not prove even brighter than the one which it has just completed.

N. R. S.

# SCIENCE NOTES AND NEWS

### Helminthological Society of India

At a meeting of the Helminthological Society of India held in Lucknow on April 8th, the following papers were read: "A Redescription of *Bucephalopsis Karvei* (Bhalerao, 1937) from *Belone cancilla*" by Mr. S. P. Gupta; "A New Species of *Asymphylodora*" by Mr, N. N. Srivastava and "The Life-History of *Moniezia expansa*" by Mr. Suresh Singh. The following were elected as Honorary Fellows of the Society: Professor R. T. Lieper, F.R.S., Emeritus Professor of Helminthology, University of London and Professor Emile Brumpt, Professeur de Parasitologie and Director, Institute de Parasitologie, Universitte de Paris, France.

A resolution moved by Dr. J. Dayal stressing the immediate need of the establishment of a Nationl Research Laboratory for Parasitology was unanimously passed, and the Society also accepted a suggestion made by Dr. S. L. Hora for the preparation of a list of workers and institutions in the country interested in helminthology with a view to ensure greater contact and co-operation among them.

### Indo-Pacific Fisheries Council

The Indo-Pacific Fisheries Council held its 2nd Annual Meeting at Cronulla, N.S.W., Australia, from April 17 to 28, 1950. The Meeting was attended by 35 Representatives of 11 of the 14 Member Governments of the Council. Representatives were also present from SCAP, UNESCO, and the South Pacific Commission.

The Council elected Dr. J. D. F. Hardenberg of Indonesia as its Chairman and Dr. D. V. Villadolid of the Philippines as its Vice-Chairman for 1950-51. Technical Committees were appointed and various Ad Hoc Sub-Committees were set up. Mr. W. H. Schuster of Indonesia was appointed Chairman of Technical Committee I, which deals with biology and hydrology, and Mr. G. W. Rayner of Australia was appointed Rapporteur. For Technical Committee II, which deals with technology and economics and statistics, Mr. Claro Martin of the Philippines was appointed Chairman, and Mr. C. G Setter of Australia was appointed Rapporteur.

The Council received a wide range of technical papers relating to all aspects of its programmes. These papers were received in by the full Council and were also discussed by the Committees. The latter presented reports submitting various recommendations and resolutions for the work of the Council during the succeeding years.

Technical Committee I has proposed work on the Tunas and also on the neritic-pelagic group of fish; it will carry out work on fish culture and on the transplantation of fish. There will be work on planktology, hydrology and taxonomy. Technical Committee II will continue its programme of surveying the industries of this region.

One of the Council's major projects consists of a Register of the Projects, Institutions, Vessels and Personnel concerned with fisheries work in the Indo-Pacific region. Plans have been made for the completion of this Register and for its publication at the earliest opportunity.

### Building Research Congress, 1951

A comprehensive congress on building research is to be held in London from September 11th to 20th, 1951, to review the progress made in research in relation to architecture, building, and the associated branches of civil engineering and will be the first of its kind ever to be held.

The Congress is sponsored by the British professional institutions and learned societies interested in building science, and by government departments, with the support of representative industrial federations in Great Britain. The Department of Scientific and Industrial Research is providing the central organisation for the Conference. Papers are being invited from research workers in many countries on a wide range of topics, and arrangements are being made to welcome to the Congress a large number of visitors from overseas.

The scope of the Congress is indicated by the following representative list of subjects. The papers presented will deal with recent research and its influence on modern development.

The effect of summer and winter conditions on the heating and cooling of buildings; the lighting of buildings; problems of special types of buildings, particularly schools, hospitals and factories; the acoustics of auditoria and broadcasting studios.

Mechanisation of building operations; prefabrication; steelwork design; concrete design; soil mechanics and the design of foundations.

Weathering and durability of building materials in temperate and extreme climates;

lightweight concrete; quality control and accelerated curing of concrete; development in manufacture and the structural use of burnt clay products; stone for housing and developments in quarry mechanisation; gypsum products, limes, painting, etc.

The Congress will be organised in three divisions which will hold concurrent meetings. Visits to buildings of interest] and to civil engineering works, etc., will be arranged during the period of the Congress.

Further information can be had from the Organising Secretary, Building Research Congress, 1951, Building Research Station, Bucknalls Lane, Garston, *Watford*, Herts, England.

## RESEARCH FELLOWSHIP AWARDS

| Institution | Recipient | To work on | At |
|---|---|---|---|
| NIS Senior Research Fellowships | Mr. S. P. Basu, M.Sc. (Cal.) | Some physico-chemical factors affecting fresh-water fish cultural practices | All-India Institute of Hygiene and Public Health, Calcutta |
| | Dr. Sukh Dev, Ph.D. (Punjab) | Studies in Sesquiterpenes | Indian Institute of Science, Bangalore |
| | Dr. P. B. Mathur, D.Sc. (BHU) | Preventive measures to eliminate the loss of vitamin C during storage in potato tubers | Agricultural College, Benares Hindu University |
| | Mr. V. R. Thiruvenkatachar, M.Sc. (Mys.) | Compressible Fluid Flow | Central College, Bangalore |
| NIS Junior Research Fellowships | Mr. V. Chandrasekharan, M.Sc. (Mys.) | The scattering of light in crystals and determination of elastic constants | Indian Institute of Science, Bangalore |
| | Mr. A. K. Chaudhuri, M.Sc. (Cal.) | Electron Optics of the electron gun used in Electron Microscopy. | Calcutta University |
| | Dr. G. S. Deshmukh, D.Sc. (BHU) | Analytical Aspects of Cerium and Thorium Chemistry | Benares Hindu University |
| | Dr. B. D. Mundkur, Ph.D. (Wash.) | Heredity and Variation in Ascomycetes, particularly anti-biotic yielding Fungi | Bombay University |
| | Mr. N. Satapati, M.Sc. (Andhra) | Petrology, Petro-chemistry and Petrotectonics of Eastern Ghats | Andhra University |
| | Dr. G. Venkatachalam, Ph.D. (East Lansing) | Animal Breeding including Animal Genetics and Applied Statistics | Livestock Research Station, Hosur |
| | Dr. (Mrs.) Vidyavati, Ph.D. (Luck.) | Problems in the Anatomy of *Labeo Rohita* | University of Delhi |
| Imperial Chemical Industries (India) Research Fellowships | Mr. C. Balakrishnan, M.A., B.Sc. (Mad.) | Study of Internal Conversion Coefficients of radio-isotopes | National Physical Laboratory, New Delhi |
| | Dr I. M. Chak, Ph.D. (Bom.) | Preparation of Hæmostatics from oil-seeds | Indian Institute of Science, Bangalore |
| | Mr. A. G. K. Menon, M.A. (Mad.) | Ichthyological studies with special reference to Zoogeography | Zoological Survey of India, Calcutta |
| | Dr. G. C. Mitra, D.Phil. (Cal.) | Morphogenetic studies : The origin and development of the leaves and their parts at the shoot apices of Angiosperms | Calcutta University |

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